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IN ITS 76th YEAR

September 19 1959

Editorial

NOTES OF THE WEEK 199

Articles and News

NEWS BRIEFS 200
SYNTHETIC RUBBERS IN CABLES—5 202
ADMINISTRATION AND MANAGEMENT 205
1972—AND ALL THAT 206
RUBBER AND PLASTICS AT FARNBOROUGH 208
NRDB ANNUAL REPORT 210
RUBBER STOCKPILE SALES 211
PLASTICS MATERIALS AND PROCESSING 212
RUBBER MATERIALS 214
TYRE REPAIR EQUIPMENT 216
I.C.I. 'MELINEX' PLANT 222

Features

VIEWS AND REVIEWS 218
QUESTIONS CORNER 220
MEN AND MATTERS 221
REVIEW 224
RUBBER STATISTICS 226
RUBBER CROP RETURNS 226
PATENT SPECIFICATIONS 228
RUBBER AND PLASTICS STOCK MARKET 229
RUBBER MARKETS 230
INDUSTRY INTELLIGENCE 231
TRADE MARKS 232

Classified Advertisements . . . 233 **Advertisers Index . . . 236**

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NOTES of the WEEK

Very High Polymers

IT seems reasonably certain that small but important quantities of rubber and plastics have now reached the moon. The 800 lb. or so of radio transmitters and other scientific instruments carried in a sphere in the head of the final stage of Russia's latest rocket were in all probability cradled in rubber latex foam in order that they might remain operative after the tremendous acceleration of blast-off. That some plastics materials were incorporated in the instruments seems equally certain. It occurs to us that the answer to the old question 'How high is a polymer?' can now be answered—235,000 miles. In passing, we understand that there is no truth in the rumour that the George Cohen '600' Group have already launched a rocket to recover the scrap.

Industrial Training Services

WHAT some employers' organizations and joint bodies are doing in the way of providing training services for the benefit of the firms in their industries is described in a booklet, entitled 'Training Services in Industry,' just published by the Industrial Training Council. The Council was set up a year ago to keep under review the recruitment and training of workpeople and to encourage, assist and inform industries about these matters. It is devoting attention in the first place to the problem presented by the coming 'bulge' in school-leavers so as to ensure so far as is possible that industry's training arrangements will be adequate to enable the best use to be made of the increased number of young people who will be entering employment over the next few years. As the chairman of the Council, Lord McCorquodale, says in a foreword: 'The solution of the problem of the "bulge," by seizing the opportunity which it provides for building up the trained labour force our country will need in future years, will depend on the action taken by individual employers. This problem is an urgent one and it calls for a clear lead from the centre of each industry. This lead can only effectively be given by the employers' organization working in close cooperation with the trade unions. This, the Council's first booklet, describes how this central lead is being given in some industries. . . . The Council is convinced that other industries could derive great practical benefit by setting up services on similar lines, and it hopes that the employers' organizations and trade unions in every major industry will see the advantages of this approach to the problem and be encouraged to develop a training service in their own industry.'

This story of the development of training schemes and advisory services describes the main functions of these services under various headings such as provision of information, practical training and training aids, supervision of training and further education, recruitment, selection and induction, and research into training methods. Services and assistance also available to employers from the Ministry of Labour and a number of voluntary bodies find a place in the booklet. The Council announced last May that it has accepted the Government's offer of a grant of £75,000 to help accelerate the expansion of training for young people in the exceptional circumstances created by the 'bulge' in school-leavers in 1961, 1962 and 1963, and this is to be used to provide financial aid towards the appointment of training development officers by employers' organizations or by joint industrial councils or similar bodies. This booklet gives practical examples of the kind of work which can usefully be done by such officers. Copies may be obtained from the Council, 36 Smith Square, London, S.W.1, price 1s. 6d.

Stockpile Stocks

THE announcement by the Board of Trade in mid-week that it is to liquidate its strategic stockpile of 100,000 tons of rubber came as something of a shock to rubber markets in London and overseas. The effect was the greater because of the news, announced a day earlier, that the US is to release 470,000 tons from their stockpile over the next nine years. Plans for these moves were co-ordinated by the UK and the US Governments. The UK Government's announced intention is to dispose of the stocks as speedily as possible, but it is stated that this will be done according to market conditions and that efforts will be made 'to avoid disruption of the market.' The fact that consultations have been held with rubber-producing countries most probably means that prices will not be allowed to fall to such an extent as to endanger the economic position of plantation companies. The immediate effect of the announcement was that spot rubber supplies closed on the London market 1¼d. lower. The medium-term effect will probably be advantageous in that supplies of high-grade rubber, now rather short, will be increased. The price reduction will most likely be welcomed also by natural producers as it may serve to offset somewhat the swing to the use of more synthetic. We understand that the Board of Trade hope to publish details of disposal schedules by mid-October. Until that time, at least, there must remain some uncertainty about the full effect of these stockpile decisions.

NEWS *Briefs*

BULGARIAN PRODUCTION — INDIAN PROJECT
BURMA/CEYLON TRADE — ISRAELI CHEMICAL
PROGRESS—SOUTH AFRICAN METAL COATING

●**United States**—The Firestone Tire and Rubber Company estimate a record net income for the nine months ended July 31 at $44,675,914 ($35,118,046, corresponding period of 1958). 'Sales and net income are the highest ever attained by the company for a first nine-month period,' Mr Harvey S. Firestone, Jun., president, announced.

●**South Africa**—Methods for applying plastic coatings to hot metals, developed by Johannesburg engineer D. H. Brooks, have been patented throughout the world. The industrial possibilities of these new techniques are claimed to be enormous. A company, backed by the Engelhard interests, has been formed to apply the techniques. A plant is being erected at Vereeniging and should be producing before the end of the year. The Engelhard group is reported to be going ahead with the establishment of plants in the USA and other countries. The new methods are stated to allow perfectly bonded and smooth coatings to be applied to metals in a wide range of thicknesses and with well-controlled accuracy. Qualities include durability and extreme resistance to chipping and action by acids.

●**Bulgaria** — According to the Bulgarian Central Bureau of Statistics, reporting on the fulfilment of economic plans during the first six months of the current year, the production of automobile tyres totalled 66,000, an increase of 16% over the corresponding period of 1958.

●**Israel**—The chemical pilot plant at the Technion, Israel Institute of Technology, has now completed the development of two compounds, raw materials for plastics, which may open an entire new industry in Israel and make possible large savings in foreign currency. These compounds, ester plasticizers, at present exclusively imported, depend on a supply of sebacic acid, derived from castor oil which is readily available. The pilot plant is headed by Dr D. Kohn, Senior Lecturer in the Technion's Chemistry Department.

●**United States** — Reynolds Metals Company's new plastics' plant at Grottoes, Va., went on full-stream operation last Friday as final items of equipment were put into production. This completed the three-year metamorphosis of Grottoes' only industrial facility from idle textile mill to busy film factory. The plant, which employs about 200 persons, is now producing a full line of polyvinyl chloride and polyvinyl alcohol films under the Reynolds plastics' trade name 'Reynolon.' The plastics line includes a new plastic household warp which will be introduced in the first markets early this autumn. Plant capacity was not given.

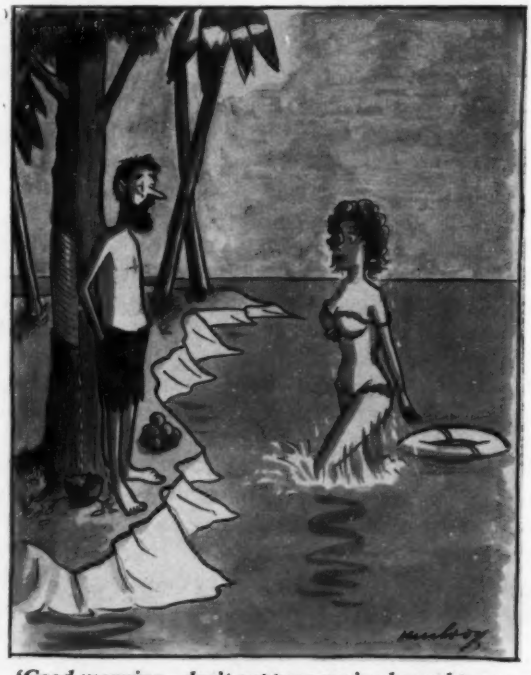
●**Japan** — Consumption of crude rubber during July is estimated at 13,000 tons by the Japanese Rubber Importers' Association, compared with 12,800 tons in June. The Association puts stocks of crude rubber at the end of June at 11,960 tons, compared with 12,830 tons at the end of May. It is estimated that the stocks decreased to 11,130 tons at the end of July.

●**Burma**—The Trade Development Ministry in Rangoon has announced that a Burmese trade delegation led by the Minister of Trade would leave for Ceylon today (September 19) to propose that Ceylon take an increased tonnage of Burmese rice in exchange for Ceylon rubber.

●**Dominican Republic**—The Dominican Republic firm of Industria de Plasticos is to produce a larger range of plastic products with an investment of $105,000 on new machinery. The president of the company, Senor Luis O. Pannocchia, states that production will shortly start on plastic tubes, plates, bowls, cups, baskets, toys and portable tables for radio and television. Garden hose is the firm's best selling line and one million feet will have been produced in the first twelve months of its existence.

●**United Kingdom**—The Federation of British Industries and the Swedish-British Chamber of Commerce are to hold a joint conference in London on September 23 to discuss ways of expanding Anglo-Swedish trade beyond its present level.

●**Peru** — The German Ferrostahl group has submitted an offer to finance the cost of machinery and construction of a synthetic rubber plant in Pernambuco, Peru.



'Good morning—don't suppose you've brought any sulphur have you?'—450

●**India** — Following the visit of a panel of US experts, the Indian Government is considering the establishment of a synthetic rubber plant at Bareilly (UP). No final decision has yet been taken. The plant would have a capacity of 20,000 to 30,000 tons—about 5,000 to 7,000 tons of styrene, and 15,000 to 20,000 tons of butadiene.

●**Russia**—The proposed British Trade Fair will, it is reported, be opened in Moscow on June 9 1961. The fair, which will last for just over two weeks, will be housed in Sokolniki Park in Moscow.

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p.859

Synthetic Rubbers in Cables—5

BUTADIENE-STYRENE COPOLYMERS

By W. S. PENN, B.Sc.

SBR is the forgotten synthetic rubber of the cable industry. British Standards at present allow only 33⅓% of the polymer used in the sheath to be SBR. However, the situation will probably change in the not too distant future, which will enable the cable industry to gain large scale experience and save money at the same time.

In spite of the difficulties with regard to British Standard specifications, some experience has been gained. First much pilot plant work has been carried out, the amount allowed in sheaths has been used and cables have been made to US and Canadian specifications, not to mention wartime experience.

Apart from standard SBR grades, use has been made of high-styrene resins and cross-linked polymers as process aids. It is, therefore, possible to make a useful survey of experience to date and to consider future prospects.

Previous articles in this series, which is to be continued, appeared in RJIP August 22 and 29, September 5 and 12.

Choice of Polymer

The choice of polymer will depend on the end usage envisaged. In particular low-ash polymers must be used for insulation. A summary of the types of polymers likely to be of use to the cable industry is given in Table 1.

TABLE 1

General designation	*Polymer Corporation designation*	*Staining characteristics*	*Ash content*	*Use*
1000	Polysar S	Staining	Normal	Hot polymer for sheaths
1001	Polysar S50	Non-staining	Normal	Hot polymer for sheaths
1004	Polysar S65	Non-staining	Low	Hot polymer for insulation
1500	Polysar Krylene	Staining	Normal	Cold polymer for sheaths
1502	Polysar Krylene NS	Non-staining	Normal	Cold polymer for sheaths
1503	Polysar Kryflex 200	Non-staining	Low	Cold polymer for insulation

Butadiene/styrene/copolymers/for/cables

The use of staining or non-staining types will clearly depend on the colour of the sheath involved. Presumably most consumers will now employ the cold polymer types.

Specifications

In BS 2899, no allowance is made for the use of SBR in insulation and only one-third of the polymer is allowed to be SBR in the general purpose sheath. None is allowed in the heavy duty sheath. It is probable that this situation will be remedied within a reasonable period. In the meantime experience must be gained as best as possible. There are various US specifications and details of these are given in Table 2.

TABLE 2

	D.754 Synthetic rubber heat-resisting insulation	*D.755 Synthetic rubber performance-grade insulation*	*HD sheath (ASTM D.866)*
Initial properties:			
Tensile strength, psi	700	700	1,800
Elongation, % minimum ..	300	300	300
After oxygen bomb ageing:	†	§	‡
Tensile strength, psi	50% of original	75% of original	1,400
Elongation, %	50% of original	65% of original	200
After air bomb ageing:	*		
% Tensile strength retained..	50	—	—
% Elongation retained ..	50	—	—

*20 hr. at 127°C. §96 hr. at 70°C. †168 hr. at 80°C. ‡48 hr. at 70°C.

US specifications for SBR compounds

It should be noted that the ageing requirements in terms of the severity of test, are far more stringent for the heat resisting synthetic rubber than the performance grade synthetic rubber. Clearly these types of stocks have non-black fillers, or nearly so, and the tensiles required are accordingly quite low.

SBR Insulation—Physicals

Some typical compounds and results obtained with them or suitable types of SBR insulation are given in Table 3.

In Table 3 it may be observed that Mix No. 1 is not really an insulant, but has been included for comparison purposes. All the mixes are suitable for CV operation. It should be noted that for 'longi' work at least 40% of the polymer should be replaced with natural rubber.

As far as the type of polymer is concerned, the cold types are marginally better than the hot types, but not more.

Talc has been given as the type of filler but other combinations are certainly possible or even desirable. The use of activated calcium carbonate, whiting and china clay are obvious alternatives which work perfectly well.

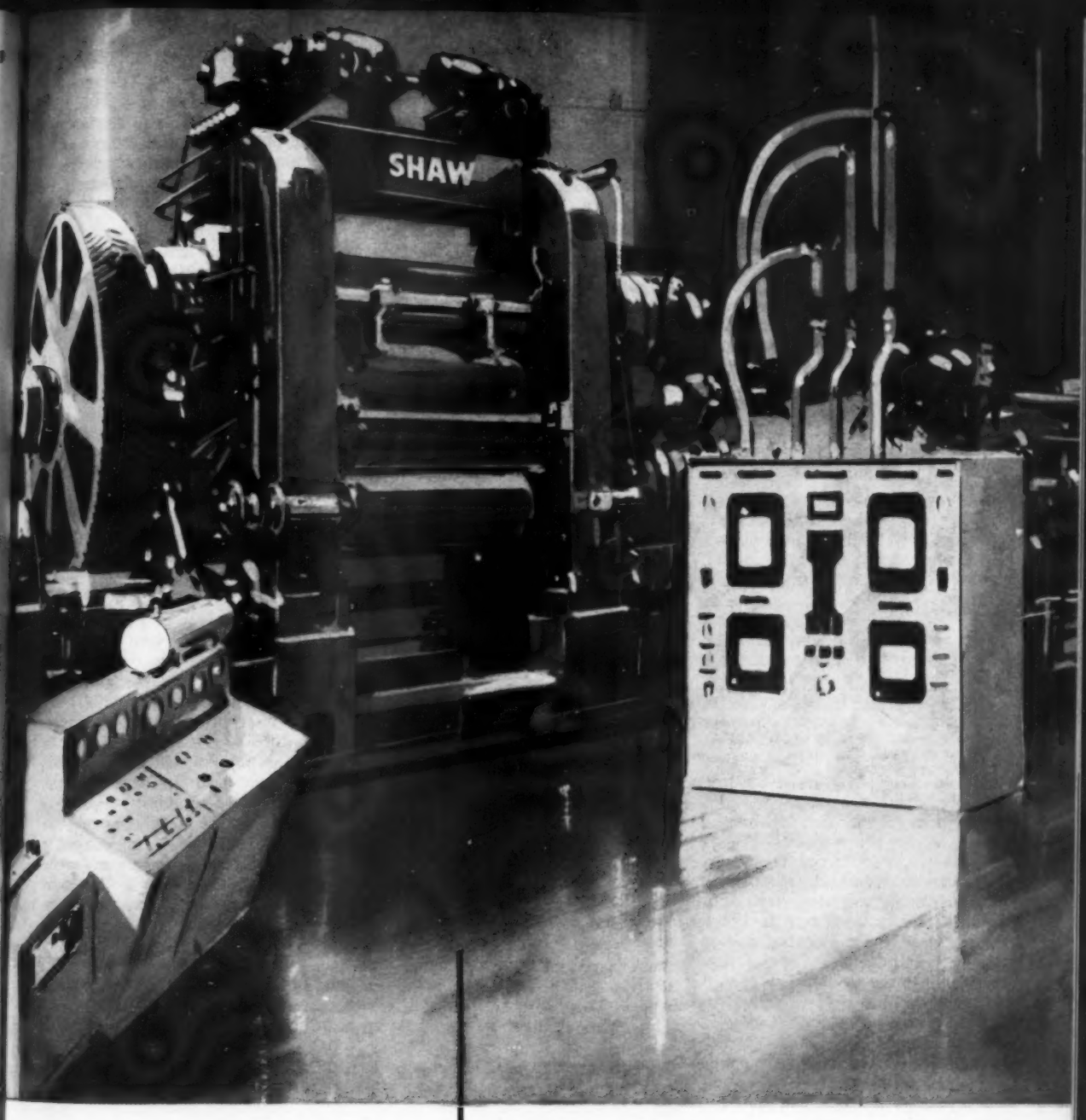
The curing ingredients are also open to wide variation. However, a main accelerator in reasonable proportions with a booster in small proportions is normal. Sulphur can be varied also and tends to be on the low side. As far as antioxidants are concerned there are many rival claims and the choice must be left to the individual.

The tensile and ageing properties obtained are quite good. They can be even higher although the figures given probably represent average values. If, for any specification, the figures are not considered to be high enough they can always be boosted with a proportion of natural rubber.

SBR Insulation—Electrical Properties

The electrical characteristics may be considered under two headings. First actual insulation resistance and second stability in water.

The SIR of typical SBR mixes (of 50%-60% by volume polymer content) is between 1×10^{14} and 1×10^{15} and gives figures roughly comparable with equivalent natural rubber compounds. In terms of a 7/.029 250-volt core, the megohms per 1,000yd. required are 400. With the types of insulation given in Table 3 (except Mix No. 1) it is quite possible to obtain values in excess of this. In the case of Mix No. 1 values of the



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OVERSEAS AGENTS THROUGHOUT THE WORLD

P 2807

order of 30-40 megohms are obtained as would be expected.

As far as stability in water is concerned it is appreciated that SBR is not as good as butyl rubber. The electrical stability test (ASTM D754) requires that the increase in capacitance between the first and fourteenth days shall not exceed 20% and between the seventh and fourteenth days shall not exceed 5%. For butyl rubber the equivalent figures are 6% and 2.5%. With the low ash polymers there is no difficulty in meeting the former requirements.

TABLE 3

	(1)	(2)	(3)	(4)
Cold SBR, high ash	100.0	—	—	—
Cold SBR, low ash	—	100.0	—	—
Hot SBR, low ash	—	—	100.0	50.0
Smoked sheet	—	—	—	50.0
Zinc oxide	6.0	6.0	6.0	6.0
Antioxidant (PBN)	2.0	2.0	2.0	2.0
Paraffin wax	2.0	2.0	2.0	2.0
Process oil	9.0	9.0	9.0	7.0
Stearic acid	1.5	1.5	1.5	1.5
Talc	160.0	160.0	160.0	160.0
MBTS	2.5	2.5	2.5	1.5
ZDC	0.15	0.15	0.15	0.1
Sulphur	1.5	1.5	1.5	2.0
Mins. cure at 141°C.	20	20	20	20
Tensile strength, psi	1,310	1,320	1,200	1,650
Elongation, %	500	490	520	450
After Geer ageing (five days at 82.2°C.):				
Tensile strength, % retained	85	86	83	85
Elongation, % retained	75	80	76	78
After oxygen bomb ageing (five days at 70°C.):				
Tensile strength, % retained	92	95	90	—
Elongation, % retained	90	92	90	—

SBR insulation compounds

Another indication of resistance to water is the gravimetric test. For butyl the maximum figure is 15mg. per sq. in of water absorbed and in practice figures of 3.0–8.0 are obtained. In the case of SBR a suitable specification figure would be 30mg. per sq. in. and figures of 15.0-20.0 are obtained. Mix No. 1 with the high ash polymer does not comply with this specification.

SBR Sheaths

The development of SBR sheaths will undoubtedly take place in two or three stages. The first obvious step is to use the quantity now permitted in GP sheaths. From 33⅓% SBR to 100% SBR may seem a big step and whilst gaining factory experience it would perhaps be advisable to introduce a mix with 66⅔% SBR.

Another problem is the use of SBR in HD sheaths. The American specifications already allow for such a mix, but such a development is problematical in the UK.

A selection of sheathing mixes is given in Table 4.

Essentially GP sheathing mixes need not be any different to the insulation. They are basically white filler mixes, although a little FEF Black helps boost tensiles. Nevertheless perfectly satisfactory mixes can be made with all white fillers.

Much the same comments on compounding apply here as with insulation mixes. The same type of accelerator system is required, and the same combinations of the different fillers may be employed. There tends to be more accelerator with increasing SBR content.

The choice of polymer seems to fall on the 1500 type. Staining does not matter in most cases since the sheaths are black. If coloured sheaths are required the 1502 type should be employed.

TABLE 4

SBR 1500 (Krylene)	33.3	66.7	100.0	100.0
Smoked sheet	66.7	33.3	—	—
Zinc oxide	6.0	6.0	6.0	6.0
Antioxidant (PBN)	1.75	1.75	1.75	1.75
Paraffin wax	3.0	3.0	3.0	3.0
Stearic acid	1.5	1.5	1.5	1.5
Talc	125.0	125.0	125.0	60.0
ACC	35.0	35.0	35.0	40.0
Whiting	—	—	—	45.0
FEF black	10.0	10.0	10.0	20.0
Process oil	13.0	15.0	17.0	17.0
MBTS	1.4	2.0	2.5	2.5
ZDC	0.1	0.1	0.15	0.15
Sulphur	2.0	1.75	1.5	1.5
Mins. cure at 141°C.	15	15	15	15
Tensile strength, psi	1,850	1,600	1,450	1,570
Elongation, %	465	470	550	510
After Geer ageing (five days at 82.2°C.):				
Tensile strength, % original	88	80	75	78
Elongation, % original	75	74	70	70

SBR sheathing compounds

A word may be said regarding HD sheaths. There is no difficulty in making a heavy duty sheath to the US specification which requires a tensile strength of 1800 psi. Actually this value is between our GP and HD sheaths and cannot be regarded as strictly comparable eo either. As far as the HD sheath in BS 2899 is concerned it is possible to add a proportion of SBR and still comply with the physical requirements (although not the compositional requirements).

Processing

To those who remember wartime GR-S the processing of the present cold polymers must seem extremely easy. Even now hot SBR needs extra premastication compared with the cold types.

No doubt it will not be long, if it has not already happened, that SBR compounds will be mixed in one stage. This becomes increasingly possible with oil-extended polymers. However, at the present stage of development it seems wisest to retain a two-stage mixing process. Once this has been accepted the mixing cycle is very similar to those employed by many cable companies for natural rubber compounds.

Usually it is best to add the polyber to the Banbury with steam on. Premasticate for about two or three minutes and then turn the steam off. The softener should be added followed by the filler in at least two stages, if not three. It is quite possible to dump in nine to ten minutes, but there is no harm in extending the cycle to twelve minutes. The temperatures at the beginning of the cycle will be found to be extremely high, but this need not give any cause for alarm. Cold water, however, should be circulated through the Banbury as soon as possible after the initial premastication. At the end of the Banbury cycle dump on to cold mills, slab off and allow to cool. Later on, preferably twenty-four hours after, remill and add the sulphur and accelerator. The long standing time can be reduced to an hour or so, provided really thorough cooling facilities are available.

Calendering and extrusion present no particular problems. In fact the extrusion of SBR compounds is likely to be found to be simpler than natural rubber compounds and needs no special comment.

Other Polymers

There are various special purpose polymers which have a limited application in the cable industry. These are high-styrene resins, cross-linked polymers and high molecular weight types.

The high-styrene resins and the cross-linked polymers are used as process aids, either with natural rubber compounds, mixed polymer types or even straight SBR compounds. Proportions between 5% and 20% may be employed depending on the rigidity required and the smoothness of extruded surface required. Whether one should replace part of the polymer with these materials, or regard them purely as process aids like softeners is an open question. Perhaps the latter procedure can be followed if the quantities are small.

The use of very high molecular weight cold polymers is likely to be of some interest. Considerable amounts of softeners, including flame-retardant types may be added. In the latter case highly satisfactory flame resistant mixes can be developed.

Oil-Extended Polymers

It is possible that oil-extended polymers of the 1710 type (37.5 parts oil) will find a place in the cable industry. However, specifications do not allow their use at the moment and how they will be permitted to be used from the polymer content point of view is problematical.

Such polymers can, of course, be added to natural rubber without or in addition to standard SBR types. This depends entirely on the quantity of SBR already present. Probably it will be necessary to replace part of the SBR component with the oil-extended type. Even so a worthwhile saving in cost is still possible.

There is very little difficulty in replacing up to twenty parts of the polymer with oil-extended types. Above this figure the ageing properties tend to deteriorate, particularly in the case of elongation. It is probably this factor which will decide the upper limit to the amount which can be used.

Conclusions

The use of butadiene - styrene copolymers in cable compounds at the present time is not very extensive. Nevertheless the prospects are good. First of all the adoption of SBR compounds depends on specification changes. When these will come about is a matter for conjecture, but it is probable that changes will be made in the reasonable future.

Even when the specification change is made, the extent of the changeover is problematical. Clearly if the price of natural rubber is high there will be an incentive for a quick change. If there is not much difference in price the change will be much slower. Consumers will have to learn that there are other advantages to these materials than mere price reductions. When this happens, there is little doubt that SBR compounds will be used on at least the same scale as natural rubber.

(To be continued)

Administration and Management

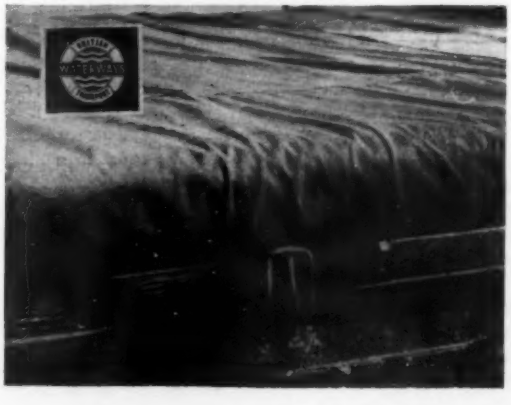
COMMUNICATION IN THE FACTORY

'COMMUNICATION is essential for control,' said Mr K. Lawrence of the Training Department, Dunlop Rubber Co. Ltd., in his recent lecture at the National College of Rubber Technology. Whether supervising people or automatic machines it was necessary to feed in information concerning their needs in order to obtain the desired results. In addition, communication was one of the basic needs of people.

Management was a form of control which depended upon communication. Answering the question 'When does a manager start managing?' Mr Lawrence said that a manager's function was to get results from people. Therefore, although he must first make decisions, he started to manage as soon as he communicated his needs to others.

Communication, to be effective, must put minds into contact and this did not necessarily involve the use of words—a fact well known to those who practised dumb insolence, the knowing nod, the grimace and the black look. Thus the spirit behind the act was of more consequence than the words used. Words were often misunderstood or their meaning only partially comprehended. So, although lines of communication existed, actual communication did not necessarily follow. The lecturer quoted relations between Britain and the USSR as an example and asked: 'Do we know what the Russians want? Do they know what we want? We only think so.' Ample means of communication were available but real communication was meagre. In the factory also, although the means existed, poor communication led to unsatisfactory results and the comment 'I told him' was often heard. The only test of effective communication, of real contact with the mind of the other person, was the action which resulted, rather than the words of the reply.

Mr Lawrence then went on to analyse communication into several parts. The lines of communication were essential; if not installed they would grow up and become a factory 'grape-vine' which was unsatisfactory because it generally became a channel for rumour as well as fact. A system of lines of communication was therefore an important part of industrial organization. Such systems were then discussed and examples quoted from experiences in the Dunlop organization.



16ft. x 21ft. British Waterways barge reinforced PVC hatch covers weighing only 35 lb. as against approximately 2 cwt. for a normal tarpaulin, have been developed by Pakamac Ltd. Rubber Improvement Ltd. inform us that the material used is 'Riltex,' which fact was omitted from the original news item in *RJIP* of August 15

1972 — And All That

POLYTHENE TUBING

BY DAVID ALEXANDER

POLYTHENE tubing produced to the British Standard 1972 is being used in the United Kingdom for domestic, agricultural and industrial cold water services in considerable quantities. It is very easy to handle and can be transported without difficulty due to its lightness. It also has the property of being able to be bent cold to a radius of approximately eight times the outside diameter. There are two great advantages in the use of polythene piping, one is its ability to withstand frost damage and the second is the low sound conductivity factor. At present experiments are being carried out with the hope that in the near future high density polythene, polypropylene or some other plastic material will be proved suitable for the conveyance of hot water in domestic and other similar installations.

When there is a large domestic application for plastics, as certainly is the case with polythene tubing, a considerable commercial interest is developed especially with the future commercial possibilities which must result from the new materials now being developed.

Consumption Prospects

It is obvious that the consumption of polythene and other tubing is at present small compared with the overall consumption that can be envisaged within the next 10 to 15 years and naturally this has attracted a number of people into the industry. There would seem to be generally two types of main polythene tubing producers in the UK, one is the big metal pipe producing company who perhaps see a loss in traditional pipe sales, and the other is the plastic tubing extrusion company which sees the market potential for BS 1972 polythene tubing and has never in any way been connected with the steel tubing industry.

As a result of this situation a commercial sales battle, in effect, has taken place which has resulted in progressively lower prices until now there exists a situation in which it is hard to believe that some extrusion companies producing polythene tubing are doing this on an economic basis. Continuous price cutting has already resulted in at least one fairly large organization selling out and another cutting out entirely the extrusion of BS 1972 polythene tubing. Obviously, if this process continues the result may be that perhaps two or three large organizations will remain. At this point it could be that prices would be raised to an 'economic level.'

However, until this possible conclusion is reached, considerable dangers will exist which certainly cannot be ignored, for no company is going to sit back and watch sales figures drop without attempting to do something about it. Already various practices are carried out by both big and small organizations in order to meet competitors' prices and still show some profit.

It may be interesting, therefore, to examine the various factors involved in the production of polythene tube from which certain conclusions must be drawn.

Production Factors

There are five main factors involved as follows:

1. Material, raw material sources and prices
2. Labour
3. Type of plant
4. Sales and distribution costs
5. Development projects.

Included in sales and distribution will be depreciation of plant and profits, directors' fees and investment repayments and interests.

Looking at the materials first, the position in the UK generally is that there are two main raw material suppliers of polythene granules, namely, I.C.I. Ltd. and Bakelite Ltd., both of whom supply extrusion grade material in both natural and black, the black being compounded to suit the British Standard of Specification 1972. The price per lb. for polythene from either of these companies is basically the same, namely 2s. 7½d. per lb. for natural and 2s. 11d. per lb. for black polythene. There is also an additional quantity discount available to all purchasers according to the total tonnage purchased at one time, this discount, however, at its average commercial maximum seldom exceeds between 2% and 3% on the raw material price. When this discount is examined in relation to the end user price it is even less and varies between 1% and 2%. Therefore, for the purpose of this assessment, it is hardly worth taking into account.

A number of companies, however, do not purchase black polythene granules to the British Standard 1972, they purchase natural polythene at 2s. 7d. a lb. and add their own carbon black and compound this through a Banbury or an extruder at their own works. This if done correctly is an entirely satisfactory procedure and conforms to the specification and at the same time shows a saving to the tubing producer. However, in order to do this it is necessary to have either a suitable extruder or mixer which, of course, involves capital expenditure. This is where the first danger lies. The addition of the necessary percentage of carbon black into the natural polythene without using a Banbury or extruder is not really satisfactory and is carried out very much on the same basis as mixing chicken feed. When this mixture is put in the extruder it comes out to all intents and purposes as black polythene tubing and in many cases is almost identical in characteristics and properties to the tubing made from the correct compound. There is, however, the possibility that the mixture has not taken place evenly and this can result in a lower percentage of carbon black in some sections of the extruded product than in others, and although this may not be detected by the naked eye the result of this shows up in time in a lack of ageing properties when the tubing is exposed to sunlight. Also, it is not a practicable proposition for polythene tubing purchasers to have laboratory tests done on the tubing they purchase because this extra cost in many cases would not be economically worth while. Thus this fault may not come to light until after the tubing has been in use for some time.

Labour

Now to the question of labour. This to a considerable extent, depends on the overheads that exist in individual companies. For the purpose of this article let us consider an average rate of 5s. an hour, basic individual labour cost. In the case of a small factory a cost of eight times the individual labour wage per machine may be possible per hour, but in the case of a large plant with heavy overheads including widely distributed

sales staffs, a figure of twenty times the individual labour cost is not unrealistic. The result of this is that there are two figures, the first 40s. an hour and the second 100s. an hour. These figures must, of course, be related to the poundage output of each machine. For example, the machine producing 20lb. an hour would require a cost of 2s. a lb. to be added to the basic granule price (at 40s. per hour) and in the case of a machine producing 320lb. an hour a figure of 8d. a lb. would be economical. The same applies to the large company with the heavier overheads.

Extrusion Plant

There has been during the last few years a considerable amount of development and study on the subject of extrusion and extruders, and today the results of this work are beginning to show in the newer types of extruders that are coming on to the market. For a long time in the UK single screw extruders have been in standard use but now the use of twin screw extruders of both British and Continental design is increasing due to technical properties and capacities which do not exist with single screw extruders. The whole question of the type of extruder to be purchased must be very closely linked with the existing and potential market available to the individual company concerned. It is obvious that a company selling 1,000,000ft. of polythene tubing a year would never consider the purchase of one of the high output twin screw extruders. If the market potential, however, is big and especially if capital is available for stockpiling in order to allow long production runs it is only common sense to purchase a large output extruder.

For example, if two large companies with an equivalent sales outlet for polythene tubing are each equipped with different output extruders then one will show a bigger profit figure and can, if necessary, reduce prices to meet competition.

However, it is not only the extruder that must be considered but the various control equipment and accessories that go with it. Today considerable development is taking place in quality control of extrusion as a result of which outputs of between 10 and 20% higher are being obtained of good quality tubing.

Circumstances can therefore exist where, for instance, one company can run a Windsor RC 100 and obtain, say, 80lb. an hour output and another company by the use of quality control can obtain a figure of 96lb. an hour, using a similar machine. Instrumentation and temperature control of extrusion equipment is therefore a very important factor in influencing end costs. At the present time Messrs West Instruments Ltd., of Brighton, and Norfa of Germany, are both developing temperature control equipment which is well in advance of the electrical equipment normally in use with extruding companies. It is by the use of such equipment as this that much more accurate extruding tubing can be obtained and scrap rates dramatically reduced.

Sales and Distribution Costs

The sale of polythene tubing is at present so competitive and, as a result, the profits are so limited, that it is seldom an economical proposition to engage only in the sale of BS 1972 tubing. In most cases the companies engaged in the sale of this tubing also sell other types of extrusion or product so that the sales effort is not entirely devoted to one product. Not so very long ago a fairly large company did devote most of its efforts solely to the sale of polythene tubing and as a result of this found it extremely difficult to show a profit and in the end the company was closed down and the equipment was put up for sale. From this it can be seen that if an extrusion company sells a number of products then the importance of the profit figure on polythene tubing is less than in the case of a company where polythene is one of the main items of production.

Also to be taken into account in the sale of polythene tubing is the fact that the product is to some extent seasonal and therefore some form of secondary production is necessary to cover the drop in polythene tubing sales. The purchase of polythene to a considerable extent takes place in the agricultural areas of the country at present and therefore it must be very much more expensive to sell polythene tubing if the sales company has not the necessary market connexions already in existence through some other 'line.' Another advantage in selling the tubing is the availability of various types of coil, *e.g.*, 50ft., 250ft., 500ft. or more. A further point is progressive footage marking on the coils. This is not of particular interest to the end user but is of very great value to the local distributor who prefers to buy in 3,000 or 4,000ft. coils and cut off according to the footage marked on the tubing. This saves a very tiresome process of measuring and cutting and also allows easy storage, all of which are sales advantages.

Distribution is another all important factor which can influence the end cost of polythene tubing.

Development

A number of companies spend much time on the development of new techniques and processes, all of which have to be covered by the commercial costing. In many small companies no development programme takes place at all and therefore this cost is avoided. Any technical information required is usually obtained from one of the big raw material suppliers such as I.C.I. or Bakelite.

Average Selling Price

Before considering the various factors mentioned above it might be interesting to break up the costings first.

For instance in the case of ½in. bore polythene tube with an outside diameter of 0.686in. to the British Standard Specification 1972, the price scale runs from 58s. per 100ft. to 50s. 6d., dependant theoretically on the quantity ordered. In practice, however, in 90% of cases, the 50s. 6d. price is one that operates and this price is subject to considerable discounts which in some companies depends on quantity and in other companies does not depend on quantity.

The average discount available can be up to 45% and there are some instances of companies quoting up to 50%. Let us therefore examine this price more closely. The ½in. bore tube as described weighs approximately 7lb. per 100ft. and if the price of 50s. 6d. is subject to a discount of say 45% then the actual price at which the customer buys is approximately 28s. per 100ft., which means that the price per lb. for extruded tube is 4s. From this price must be taken 2s. 11d., which is the price of 1lb. of granule, leaving a figure of 1s. 1d. to cover production and all other costs. This in effect means that a machine producing 50lb. an hour earns £2 10s. from which must be taken the operator's wages, leaving £2 5s. plus electricity, maintenance, idle periods, capital repayment and depreciation, factory overheads, distribution, sales costs, company profits, and directors' fees and other costs which may vary from company to company.

At the present time there is a feeling within the plastics industry that the British Standard Specification 1972 is not rigid enough, especially nowadays when extruders are able to produce tube to much more accurate dimensions. If this revision takes place and the top and bottom limits on outside diameters and bores are

reduced then the need for expert extrusion techniques and control equipment will be much greater. From present indications it would appear that price cutting will continue although one or two of the big companies have endeavoured to raise the selling price in an attempt to try and correct the present trend. However, it is reasonably certain that if they continue to lose business they in turn will cut prices and in many cases are capable of undercutting some of the other polythene tube producers, and so this spiral would seem to continue.

There are a number of people engaged in the production of polythene tubing who would like to see this present trend stopped as it can only result in the long run in a lowering of standards for the product. Previous efforts have been made where a club or association of producers agreed to certain maximum discounts based on an agreed economical minimum figure. However, in practice it was found that these arrangements were being abused and the arrangements more or less fell into disuse. Another factor which must certainly have influenced this club was the creation of the monopolies commission and with whom such trade arrangements must be registered.

The writer does not feel that the answer to this matter lies in agreements or price maintenance arrangements. The outcome will depend less on these matters than on the combined balance of power held by the big three or four extruding companies. They, more than any, are in the position to influence the buying public and it may be that by giving wide publicity to a new British Standard Specification which is strictly adhered to and by the use of continuous sales propaganda the end user will be educated to the point where he understands that below a certain economical minimum it is physically impossible to produce tubing to conform with revised British Standard Specification for polythene tubing. If this is the case then it is up to the big extruding companies and the big end users' organizations and public authorities to get out as quickly as possible a new British Standard.

An agreement has been concluded between Semtex Ltd., Mazzucchelli Celluloide SpA and Domosic SpA (a subsidiary of Mazzucchelli) whereby the latter companies are licenced to manufacture and sell in Italy, Semastic decorative tiles and vinyl asbestos toles. Semastic tiles will be known as Silex and Vinylex tiles as Isoflex.

Rubber and Plastics at Farnborough

A REVIEW OF EXHIBITS

JUDGING from the record attendance reported, the numbers of the general public visiting Farnborough were greater than ever this year. General impressions, however, indicate that the number of technicians and invited guests was somewhat smaller.

An interesting stand at the equipment exhibition was that of Palmer Aero Products Ltd., London, N.W.8. On show was the self-inflating escape slide. This enables passengers to leave a grounded aircraft rapidly and safely in an emergency. The device is ready for operation in less than 25 seconds. Other firms using rubber proofings in their equipment included RFD Co. Ltd., Godalming, Surrey, who were showing rescue and survival equipment, targets, banners, and training balloons, and R. Frankenstein and Sons (Manchester) Ltd., Beaufort Road, Birkenhead, who were also displaying many types of life-jackets and liferafts, high-pressure suits and breathing equipment.

Seals, rings and hoses in the new solvent and temperature resistant synthetic rubbers called for in modern aircraft were to be seen on the stands of Hall and Hall Ltd., Oldfield Works, Hampton, Middlesex, Dunlop Rubber Co. Ltd., Aviation Division, Foleshill, Coventry, Super Oil Seals and Gaskets Ltd., King's Norton Factory Centre, King's Norton, Birmingham 30, George Spencer Moulton and Co. Ltd., Melksham, Wiltshire, Ronald Trist and Co. Ltd., Bath Road, Slough, Bucks., and Precision Rubbers Ltd., Bagworth, Leicester.

The performance of these rubbers has now reached a standard which would have been thought impossible even a few years ago. Fluid resistant silicone rubber, as well as light weight flexible containers for liquid or powder storage, and also polyurethane-based materials of special interest for aircraft were displayed by Fireproof Tanks Ltd., The Airport, Portsmouth. Another product of the same firm, Hyclad, consists of a metal sheet with a layer of rubber bonded intimately to one or both faces. Various types of rubber may be incorporated in the new material which should have many uses not confined to aircraft.

Another material of remarkable chemical resistance to be seen at Farnborough was Fluon, which, together with the better-known Perspex, Diakon, Darvic and other plastics, was to be seen on the stand of I.C.I. Ltd., Plastics Division, Welwyn Garden City, Herts. The same firm was also offering—probably for the first time at this exhibition—their new Butakon and Kralastic rubbers. In the plastics field, the well-known 'Araldite,' 'Redux,' and 'Hydux' adhesives and metal bonding systems were a feature of the stand of Ciba (ARL) Ltd., Duxford, Cambridge. B.B. Chemical Co. Ltd., Ulverscroft Road, Leicester, were also showing adhesives, and 'Bostik' and 'Prestik' glazing compounds. In the field of upholstery and packaging, rubberized hair was featured both by Hairlock Ltd., Iddlesleigh House, Caxton Street, London, S.W.1, and by Xetal Products Ltd., Speke Hall Road, Liverpool 24, whilst on the stand of Export Packing Service Ltd., 56 Kingsway, London, W.C.2, visitors could see how these materials were utilized to give packs of many kinds.

Amongst cable manufacturers utilizing the new rubbers and plastics were British Insulating Calenders Cables Ltd., 21 Bloomsbury Street, London, W.C.1. Standard Telephones and Cables Ltd., New Southgate, London, N.1, and The Telegraph Construction and Maintenance Co. Ltd., Mercury House, Theobalds Road, London, W.C.1.

There were many examples of fabricated aircraft canopies moulded from Perspex and other transparent plastics such as those of Thermo Plastics Ltd., Luton Road Works, Dunstable, and Suntex Safety Glass Ltd., Thorny Lane, Ivor, Bucks.

According to the catalogue of Dunlop Aviation Equipment, a modern aircraft may use up to 400 components composed wholly or partly of rubber. This fact alone would show the importance to the aircraft industry of the components which were so well exemplified at the Farnborough Show, and great credit must be given to the makers of these for the speed with which they have taken advantage of recent advances in the polymer field.

Mr N. S. Unsworth has been appointed a director of the Java Rubber Plantations and of the Soember Ajoe Rubber Estates.

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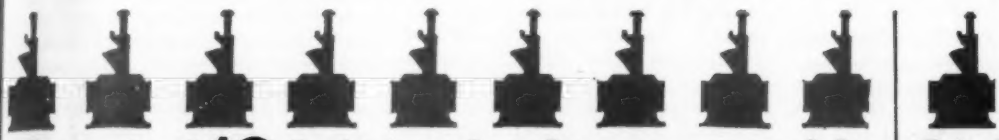

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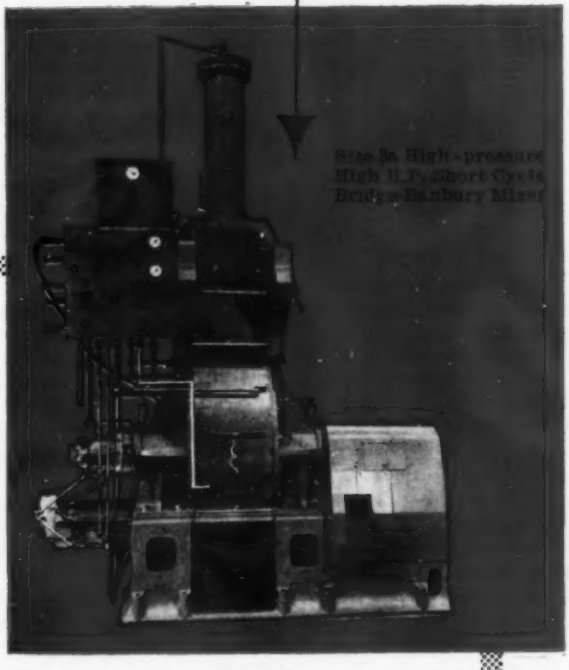

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NRDB Annual Report

NATURAL RUBBER'S BRIGHT FUTURE

PROVIDED that vigilance and energy continue to be applied to its development, natural rubber has a bright future. This is stated in the Annual Report for 1958 of the Natural Rubber Development Board.

In this connexion reference is made to a speech by the Malayan Minister for Commerce and Industry, The Hon Mr Tan Siew Sin, on introducing the Malayan Rubber Fund Research and Development Bill last December. Speaking of the challenge of synthetic rubber, the Minister said: 'Our vigorous replanting programme is one answer to the challenge and reorganization and intensification of research is another and equally important answer . . . to put it simply we must beat synthetics on price and quality. Provided we continue to meet the challenge with energy, foresight and imagination, I am convinced that the natural rubber industry of the Federation, both estates and smallholders, can look forward to a bright and prosperous future.'

A provision of the Bill was the appointment of a Controller to co-ordinate all aspects of the research and development financed by the Malayan Rubber Fund. This appointment was subsequently accepted by Sir Geoffrey Fletcher Clay, K.C.M.G., O.B.E., M.C.

Rubberized Roads

Recording encouraging progress with a long-term project—developing the rubberized road — the report states: 'The strain on the road systems of the highly developed countries of the world is increasing so rapidly that any material showing promise of improving the performance and lengthening the life of roads becomes more important each year.'

Australia afforded a particularly good example of the growing commercial acceptance of rubberized bitumen because 'the value of its extra performance is more properly appreciated where the conditions of climate and terrain are difficult and more resource has to be used by road authorities in providing satisfactory surfacings.' In Australia, 61 sections of road and a large extent of airport surfacings were installed during the year using rubberized bitumen.

Where traffic is the problem, as in cities in the UK, rubberized bitumen has also found favour on the strength of the performance of test sections laid earlier. In Hornsey, in London, for example, rubberized bitumen was chosen for re-surfacing all the main roads in the borough. 'Similarly in Birmingham,' the report continues, 'where a bus-stop was laid down for observation in 1952, followed by a full-scale laying in 1957, rubber has subsequently been specified for various roads, including both wearing and base courses for the first section of the new Inner Ring Road now under construction.'

Steady progress in the commercial development of the rubberized road is also reported from the US (where hundreds of miles of rubberized roads are now in service) and from New Zealand, the Far East and elsewhere. Other successful uses for rubberized bitumen mentioned are the lining of reservoirs, roof sealing, sealing joints in sea walls, children's playgrounds, tennis courts and running tracks.

Research on Rubber in Roads

With work on rubberized bitumen (*i.e.* bitumen incorporating rubber powder) well advanced attention was turned to extending the scope of rubber in road work still further by developing rubberized tar and latex/bitumen. The report states: 'Tar is a cheaper product than bitumen and, if capable of improved road performance by the direct incorporation of rubber, would without doubt be welcomed by road engineers. The initial efforts have been successful and in September the first full-scale road trials with rubberized tar were concluded at Clifton Hampden.' The work on rubber in tar was carried out by the British Government's Road Research Laboratory—work on latex/bitmen by the Roads Laboratory of the Natural Rubber Bureau near Washington. Full-scale experiments included a series of layings of latex/bitumen in Louisiana.

Building, Engineering and Railways

The Board continued to assist, by means of articles, booklets, lectures and films the growing use of rubber in building and engineering. The Report states: 'The technical information published under the auspices of the Board by acknowledged authorities in their respective fields has been eagerly sought by engineers and builders all over the world.'

Subjects covered included the development in the application of anti-vibration mountings in buildings, joint-sealing, the making, decorating and fixing of concrete units, earth-moving techniques, latex-cement compositions and so on. Over 100,000 architects, builders, engineers and students saw the films 'Rubber in Building' and 'Rubber in Engineering,' and received the Board's technical publications.

The Board continued to encourage the use of rubber rail pads, inserted between rail and sleeper to reduce vibration and wear, and South African Railways had by the end of the year laid some 400,000 natural rubber pads. In Australia the report states, 'The New South Wales Railways are regular users of natural rubber sleeper pads and Queensland Railways are conducting experiments.' In Israel and Japan too, many thousands of rubber pads have been laid in conjunction with concrete sleepers.

Rubber in Furniture

The Board has done much to develop the use of rubber, particularly latex foam, in the furniture industry. The report comments: 'The use of rubber in one form or another in furniture represents an outlet for natural rubber second in potential importance only to the pneumatic tyre. In 1958, total world consumption of natural rubber latex is estimated at around 165,000 tons, just over 70,000 tons going to USA and 26,000 tons to UK. Although it finds application in various industries for such purposes as dipped goods, elastic thread, adhesives, impregnation of tyre cords, and latex-cement floorings, by far the greatest proportion is utilized in foam for upholstery purposes. The market for latex foam is steadily expanding in spite of the recent introduction of plastic foams for some of which extravagant claims are being made.'

The media chiefly used were lectures, articles and filmstrips catering for the furniture industry and the technical colleges, and it is noted that latex foam is now included in the syllabuses of practically all the leading technical and domestic science colleges in the United Kingdom and

the lectures given by the Board's Consultant are an annual event for many of these.

The Board also carried out publicity directed at the general public by supplying material to the Press on methods of upholstering at home using latex foam and by means of demonstrations and lectures.

Shoe Solings

The Board forecasts 'A steadily expanding' outlet for rubber in footwear. The proportion of British footwear fitted with non-leather soles has risen from 20% in 1955 to 60% at the present time and the majority of these contain natural rubber. According to the report 'The introduction of rubber-resins in footwear compounds is widening the field of use, particularly in leather-like materials, where the outstanding properties of rubber in regard to resilience, wear and protection against damp are finding increasing favour.'

In addition to promoting the use of the various combinations of natural rubber with synthetic materials the Board also helped to maintain interest in plantation finished crepe soles made from 100% natural rubber. Among the year's new styles medium heeled ladies' walking shoes with thin soles of plantation crepe proved popular.

Publicizing Research

An important function of the Board is to draw the attention of the rubber manufacturing industry, by publicity, to new developments emanating from the natural rubber research organizations. An important development publicized during the year was Superior Processing rubber, evolved by the Rubber Research Institute of Malaya and developed by the British Rubber Producers' Research Association. The increase of 600% in the consumption of SP rubber over the previous year bore witness to its popularity with manufacturers. The Board reports 'it shows to greatest advantage in the extrusion field, and firms who have incorporated it in their production schedules are emphatic that it produces a superior end-product.' Manufacturers have asked for the benefits of SP properties to be extended to lower grades of rubber as well. 'To meet the demand,' the report states, 'the Rubber Research Institute of Malaya has developed SP brown crepe which is now undergoing commercial evaluation, and work is now in progress on a concentrated form which can be mixed with any grade of rubber to confer SP properties on the stock.'

Information Service

During the year the Board's Information Service dealt with over 27,000 specific enquiries in addition to those received at lectures, exhibitions and visits to manufacturers and the report states that this service 'provides one of the most valuable methods of influencing consumption of and promoting good will for natural rubber.'

Copies of the annual report are available free of charge from the Natural Rubber Development Board, Market Buildings, Mark Lane, London, E.C.3.

Rubber Stockpile Sales

UK AND US

THE Board of Trade has announced that it is to liquidate its strategic stockpile of 100,000 tons of rubber. The announcement followed news that 470,000 tons are to be sold from the US stockpile over the next nine years. A Board of Trade spokesman has revealed that the two plans had been co-ordinated, and that the UK and US Governments had consulted on the moves.

The UK Government's intention is to liquidate its stocks as quickly as possible 'without affecting the market.' Disposal, it was stated, will depend entirely on market conditions. The Government has had discussions with the principal growing countries about the manner of liquidation.

The Board of Trade stated that the firm market conditions of recent months had led to the decision to implement plans for disposal. Details of the method of disposal and the quantities of the various types available will be made known when arrangements have been completed.

President's Authorization

In the US on Monday President Eisenhower signed the Independent Offices Appropriations Bill. His signature formally permits the Office of Civil and Defence Mobilization and the General Services Administration to resume rotation of stocks of natural rubber, fibres and oils in the United States national stockpile of strategic materials.

On Monday also the GSA announced that 470,000 long tons of natural rubber had been declared excess to stockpile needs and that plans have been developed for its orderly disposal over a period of about nine years.

The revised determination, made by the Director of the Office of Civil and Defence Mobilization, resulted from a downward revision of objectives based on lower military requirements, technological advances, and a reduction of the planning basis for stockpiling from a five to a three-year potential emergency. The material was acquired for the national stockpile and is not obsolete; therefore, its sale required the express approval of the Congress.

Market Prices

Sales would be negotiated on the basis of prevailing market prices. While it was the objective of the General Services Administration to dispose of the entire quantity of 470,000 long tons over a period of about nine years (about 50,000 long tons a year on the average), the quantities actually released from time to time may vary considerably in order to avoid undue disruption of markets.

The Independent Offices Appropriation Act of 1960, as passed by the Congress, provided authority for the sale without replacement of excess perishable stockpile items which otherwise would suffer from deterioration if held. In accordance with this authority and pending the express Congressional approval of the overall disposal programme required under the Strategic and Critical Materials Stock Piling Act, 40,000 to 50,000 long tons of the total quantity of natural rubber to be disposed of would be offered for sale during the fiscal year ending June 30 1960.

The disposal of the natural rubber would be made in such a manner as to protect producers, processors and consumers against avoidable disruption of their usual markets and to protect the United States against avoidable loss.

Ceylon Rubber Duty Increased

The Ceylon Government announced on September 10 an immediate increase in the rubber export duty to 28 cents per lb. from 20 cents. The increase applies to all descriptions of rubber exports and follows a steady rise in the price of the commodity over the past few months. The last change in the duty was in July last year when it was reduced to 20 cents from 28.

Plastics Materials and Processing

PARIS CONVENTION—3

PROBLEMS in the rational choice and use of electric insulating materials were considered in a paper by M. G. de Senarclens, assistant director of the Swiss Insulating Factory and director of the Dielectric Co., of Delle, France, at the recent 5th International Chemical Exhibition Convention in Paris. M. de Senarclens is chairman of Group 5 of the International Standardization Committee. He is in the process of compiling the second edition of an encyclopaedia of insulating materials.

The choice of suitable material was extremely important to manufacturers of electrical appliances but the choice became difficult as more materials appeared. Published data were not always complete, in particular the weak points were not always clearly stated.

Sub-Committee 2C. had classified insulating materials according to their temperature stability but this was not always exact, and the Swiss Committee had replaced thermal classification by consideration of other details. At Philadelphia in 1954 Committee TC15 of the CEA had started work on the encyclopaedia of insulants using an original and simple mode of presentation. Designers needed to know quickly the properties of any material.

Classification

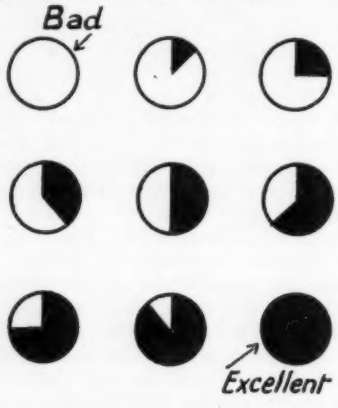
This could be done by chemical constitution but the constitution was often unknown. It could be done by the main constituent, by the end use, or by considering some specific property. Of these, the end use had been chosen. Insulants had been grouped into (1) gases, (2) liquids and (3) solids. Class (3) did not change its form in use. Class 32 indicated threads, class 33 tissues, papers, etc., class 34 non-stratified solids such as ceramics and rubbers, and class 35, stratified materials. Class 4 indicated flat materials but some were changed; for example, 43 denoted a hot glue. Class 44 denoted thermoplastic films and class 45 films which cured under heat.

Class 5 showed solid insulants received by the user in a liquid form such as mastics and plastisols. Class 511 showed asphalic material without filler, class 512 asphalic material with filler. Class 513 showed non-pigmented varnishes which dried by evaporation and class 514 similar varnishes which cured.

Two things which were chemically the same came in different classes if one was liquid and the other solid.

Indication of Properties

Tables have been used showing the properties based on the system of:



This classification was much better than the use of figures. Although there were no numbers, there was a key showing figures corresponding to what was considered bad and what corresponded to the intermediate indication. The tables enabled the weak points to be seen at once. There was also a note of any special dangers or difficulties. Whenever a property was defined the figure was given. A symbol from the above scale was put in to cover the variation in properties of the same commercial product made by different firms. As an example of the use of the tables, the lecturer considered group 344—rubbers. This showed their resistance to oil, ozone and water. It could be seen at once that acrylics and neoprene were only suitable for sheets and not for insulating because of the electrical properties.

The French edition of the book had been on sale for a year and was available for the sum of 21 Swiss francs from S.E.V., 301 Seeveld Street, Zurich 8, Switzerland. Mr Moses of the Westinghouse Co. was making a translation in America and the Swiss Committee was making a German translation.

Readers were asked to send in any corrections; so far the biggest correction suggested corresponding to 45° of the circle. The publishers had generally erred on the side of caution or pessimism.

A further edition had been prepared in which electrical considerations were not predominant. It could be considered as an encyclopaedia of the general properties of plastics.

Horners Award Winner

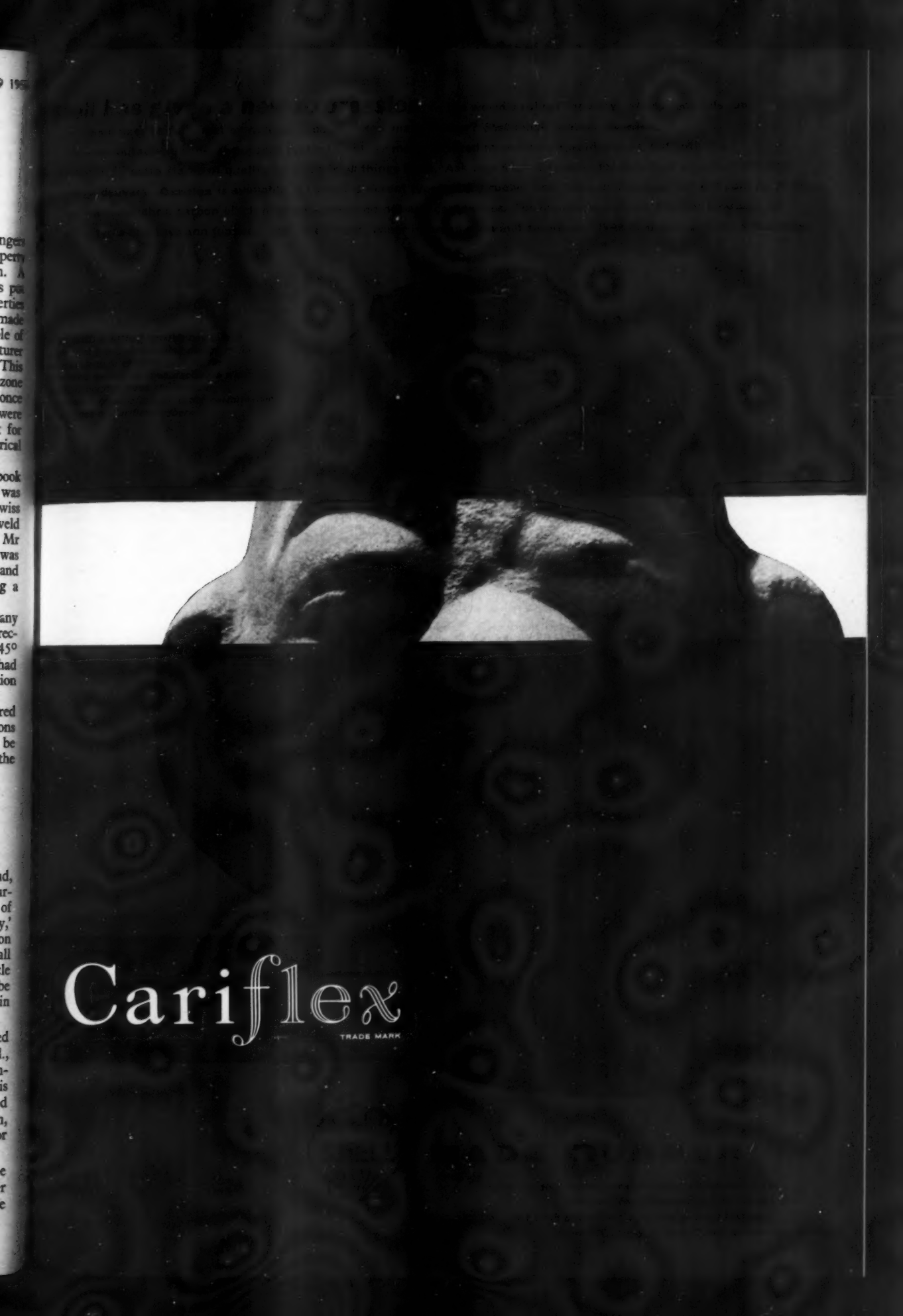
DESIGN IN PLASTICS

THE winner of the 1959 Horners Award competition, organized by the British Plastics Federation for a design in plastics materials, is Mr P. D. Durden, of Grafton Road, Sparkbrook, Birmingham. Mr Durden's design, stated by the panel of judges to show 'considerable novelty,' was for a domestic hand suction cleaner. It would have an overall length of 16½in. including the nozzle and a width of just over 6in. and be able to get to the 'odd corners' in home and car.

P. D. Durden, whose design for a domestic hand suction cleaner has won the Honours Award Competition for 1959

Mr Durden, aged 23 and employed by British Industrial Plastics Ltd., was a runner-up in the 1958 competition. This year's runner-up is Mr A. Quarmby, aged 25, employed by the British Transport Commission, Enfield, Middlesex, with a design for flexible industrial building units.

The award, of 50 guineas, will be presented to Mr Durden at a dinner in London (date not yet fixed) of the Worshipful Company of Horners.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Rubber Materials

PAPERS AT THE PARIS CONVENTION

DR J. R. Dunn, of the British Rubber Producers' Research Association, in his paper on 'Recent Studies on the Ageing of Rubber by the Technique of Stress Realization,' given at the recent 5th International Chemical Exhibition in Paris, said that the ageing of rubber was a chemical process which dramatically affected its physical properties, and physical methods could conveniently be used to follow these chemical changes. One such method which gave insight into the mechanism of oxidation degradation was the measurement of stress relaxation, *i.e.* the decay in force at constant extension with time, and the lecture described an investigation of the degradation of acetone extracted natural rubber vulcanizates by this technique.

It was stressed that to obtain meaningful results the rubber employed and the vulcanizates produced should be free from antioxidants and promoters of degradation and thin samples (0.02cm.) should be used so that diffusion of oxygen into them should not be rate controlling.

The ageing of vulcanizates cross-linked with peroxides or with tetramethylthiuramdisulphide in the absence of sulphur was contrasted with that of accelerated sulphur cures. The relaxation of sulphurless cures both at temperatures from 80–100°C. or at 25°C. under 365mμ illumination was autocatalytic and greatly reduced in presence of phenolic antioxidants and also of dithiocarbamates. There was little cross-link formation during ageing. The observed behaviour was attributed to random scission of the polyisoprene chains in the vulcanizate occurring as a variant of a propagation step in the autoxidation of the vulcanizate by a mechanism similar to that postulated for olefin autoxidation. The relaxation of accelerated sulphur vulcanizates was not autocatalytic and was not so sensitive to the presence of antioxidants, while dithiocarbamates in low concentration gave no protection whatsoever. Degradation of these vulcanizates was accompanied by sufficient cross-linking to compensate for 85% of the network loss. It was suggested that the random scission process should be suppressed in sulphur vulcanizates and that a scission reaction of short kinetic chain length should be occurring, which was not very sensitive to the presence of antioxidant. The implication of these results was that although the network of sulphurless vulcanizates was inherently less stable than that of sulphur cures it could be rendered very resistant to ageing by incorporation of suitable antioxidants.

It was pointed out that the formation of the powerful antioxidant zinc dimethyldithiocarbamate during tetramethylthiuramdisulphide vulcanization was responsible for the good ageing properties of these materials.

Elastomers and Plastomers

J. Coste, in his lecture on 'Dynamic Methods Applied to the Rheology of Elastomers and Plastomers,' said they learned by various dynamic methods whether the deformation varied periodically with time. These methods were of considerable interest both practically and theoretically, as they permitted measurements to be made in a very short time; and two physical quantities, a modulus and coefficient of internal friction could be deduced.

These methods had been subject to considerable development, and different experimental techniques depended on the following parameters:

A sustained or fading wave.

Propagation of a transverse or longitudinal wave in comparison with the specimen.

Utilization of resonance phenomena.

Sample free, or submitted to an addition static force.

Use of various frequencies (energy waves) in particular ultrasonics.

Methods described particularly were Young's Modulus and coefficient of 'Amortissement' by the vibrating wire method: modulus of torsion and 'amortissement' using a pendulum.

Dynamic methods complemented static and dynamometric methods. In particular the study of 'amortissement' (Hysteresis) curves had given information on molecular movements. There was thus developing what might be called a 'mechanical spectrum,' the interpretation of which would be of considerable interest.

Kinetic Research on Vulcanization

A paper on 'The Results of Kinetic Research on the Vulcanization of Natural Rubber and some Synthetic Rubbers,' was given by W. Scheele.

They still had insufficient knowledge on the subject of the different chemical reactions which occurred in the vulcanization of natural and synthetic rubbers, and the relationships between physical properties, and the nature of vulcanization, said Walter Scheele in his paper.

There were two main directions of research—a study of the chemical kinetics of the individual reactions, which collectively caused vulcanization, and systematic organic research to elucidate the nature of cross-linking reactions.

For several years research had been conducted at the Institute of Rubber of the Technical High School at Hanover on the kinetics of several important vulcanization reactions. Owing to the complex nature of the reactions, several different interpretations were possible. Several possible mechanisms were considered, including the vulcanization of Perbunan by sulphur and by dibenzothiazoldisulphide. The thermal vulcanization of synthetic rubbers such as Perbunan under the influence of various additives was also considered. The methods of fixation of sulphur were considered.

Mr G. D. Wreford-Brown has been elected chairman of the Belata River (Selangor) Rubber Estates in place of the late Lt.-Col. C. W. S. Gardner. Mr D. A. Gilliat has been appointed to fill the vacancy on the Board.

Polly Ester Says . . .

'Hot mixing, that's a foundryman's social'

winged horse power . . .

WHEN Athena, goddess of war and patron of the arts, caught Pegasus and surrendered him to Bellerophon she may have had the Olympic Derby in mind. But Pegasus would have none of it. Bucking Mr. B out of the saddle, the winged horse resumed his flight to the heavens.

Similarly, aviation has overcome many obstacles in its remarkable progress through the skies, not without some material assistance from Dunlop.

Safety, comfort and efficiency have been built up by Dunlop aero tyres, disc brakes, anti-skid units, pneumatic actuating systems, de-icing units, windscreen wipers and the like. Dunlop, in fact, design and produce up to 400 items of equipment in the service of the aircraft industry, further evidence of the wide and varied resources of this world organisation.

DUNLOP *makes things better for everyone*

Tyre Repair Equipment

SECTION REPAIR MOULDS

THE Grantham Rubber Machinery recently held a demonstration at their works, Gonerby Hill Foot, Grantham, to introduce the Vulcan mandrel air pressure system sectional repair equipment together with various new lines of manufacture of their own. Representatives of new tyre manufacturers, tyre retreaders, vulcanizers and distributors from all parts of Great Britain attended the event. The Vulcan equipment was

B. D. Alm, general sales manager, Vulcan Equipment Co. Ltd., Toronto, Canada, and L. W. R. Morley, managing director, Grantham Rubber Machinery Co. Ltd.

demonstrated by Mr Bernard D. Alm, general sales manager of the Canadian Company.

The main features of the design of the machines are that an electrically-heated aluminium mandrel is used inside the tyre and the tyre is also heated from the outside by means of a heat pad which covers the tread portion and one sidewall. The heat pad is held onto the tyre by means of an air bag which completely surrounds the mandrel and thereby ensures that the tyre conforms to the mandrel and make for practically invisible repairs.

Due to the fact that the air bag is wrapped round outside the external heat pad, acting as an insulator, there is practically no heat loss from the mould. The result is that the moulds offer a saving of approximately 95% on the electricity consumed during a cure as compared with the standard steam moulds fitted with an electrically operated steam generator; the passenger size mould taking 880W. and the truck size 1,100W. As the heat is applied to the inside and the outside of the tyre undergoing repair, the curing time is reduced very considerably and, in fact, passenger tyres can be cured in about 30 minutes and 10-ply truck tyres in about 70 minutes, slightly longer being necessary for higher ply ratings.

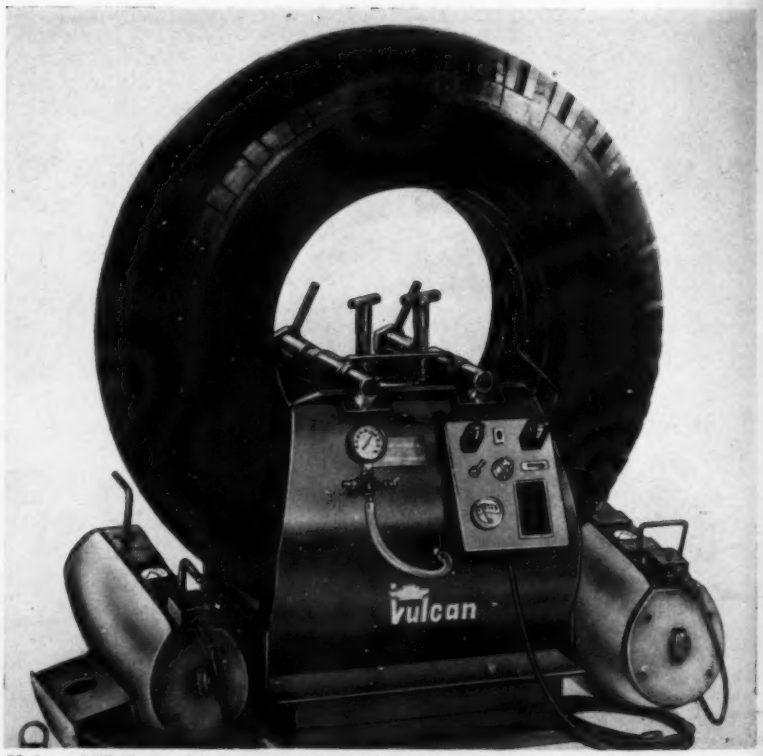
The all-welded construction of the moulds allows for a factor of safety of four even when an air pressure of 100lb. psi is used which is far higher than is normally required in this type of mould.

The Vulcan heat pad, which is constructed of silicone rubber, covers the tread portion and one sidewall only of the tyre, thus reducing white wall discolouration and cord shrinkage. Due to its soft rubber construction no damage is caused to tubeless tyre beads. The heat pads will give approximately 1,500 cures before having to be replaced. The air bag which envelopes the tyre presents a very large area of pressure on to the tyre and thus enables a very considerable force to be exerted which ensures perfect pressure and results in better adhesion, cushion flow, and a practically invisible repair in the tyre.

Electrical timers fitted to the control panels of the machines ensure that the heat is automatically turned off as soon as the cure is completed thus enabling an extra cure per day to be obtained, as the operator can insert a tyre just before he goes home and leave with the sure knowledge that he will arrive next morning to find a cured tyre in the mould. The control panels indicate when the mandrel and heat pad circuits are operating and also contain temperature indicators which show their temperature.

The model M-PB 9in. repair accommodates any size car tyre and small commercial tyres 65-750-16 and 17 and the 7-9 and 825-10 low load tyres. The Model M-TB 20in. repair accommodates 700-1,200 truck tyres and tractor tyres up to 15.5in. cross section. The model M-PB is priced at £110 in the UK.

Vulcan are also producing moulds for repairing earthmover tyres and one of the V-18 moulds for tyres up to 18.00 section is now in use at Grantham. The V-26 for tyres from 18in. to 26in. cross section and the V-28 for tyres from 26in. to 38in. will later be in service.



Vulcan MT-B mould complete with 'A' mandrel, side pad and channel iron (on left), 'B' mandrel on left

NOW Stearex Beads

News for the rubber industry! Stearic Acid is now available in 'bead' form. Made by Price's for Columbian International, STEAREX beads possess unique advantages over other forms of Stearic Acid—at no increase in cost.

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VIEWS and REVIEWS

PE Advance Continues

THE late printing stoppage may have diminished space travel through the world's technical literature by this industrious chronicler of happenings, but it has had at least one rather interesting result, namely that of a perspective view of some terrestrial events.

Thus, looking at plastics progress in USA, or opinion in that connexion as seen through the eyes of *Modern Plastics* over a three months' period (*i.e.* June, July, and August), one cannot but be struck by the evidence, to take a specific example, of the continued advance in the development of polythene (or *PE* 'for short' as *MP* has it).

In exemplification of the above I refer to the emphasis (in successive months) on new or important PE applications.

Aluminium a Plastics Competitor

In his editorial for August, Mr McCann uses the caption: 'Aluminium will give us fierce competition.' He opens by referring to excess production of the metal: 'Free-world production of aluminium increased last year from 3.6 million tons to 4.1 million tons, a 14% rise that has actually created a glut in capacity.

'So the aluminium industry is expanding its sales, public relations, and promotional programs on a scale that dwarfs all precedent.'

It seems that the packaging field, the building field, the automotive field, and the appliance field are 'the first to feel the impact of this new aggressiveness.' Apparently a main target is that of steel's present markets, but 'so are many of plastics' present markets, particularly in large area and structural components. Emphasis will be on strength-weight ratios, on flame resistance, on colour and texture, on low tool costs per piece produced.'

However, it does seem that in *combination* with aluminium, plastics should have some opportunity in a growing total market. As *MP* puts it: 'Where they can't beat us, they'll join us.' Thus vinyl-coated aluminium is already under test for construction siding; and aluminium laminated to films is already being used in luggage, housings, and appliances. Foil-film combinations, *MP* remarks, are coming along fast. Nevertheless, *Modern Plastics* expresses the view (*I presume this applies to USA*) that aluminium, as an industry, is preparing to spend large sums in propaganda.

Comment

My own view, for what it may be worth, is that *Modern Plastics*—and other eminent trade organs—bear witness in practically every issue to the astonishing and systematic progress, and, above all, to the *versatility*, of the plastics industry. Once more, to take a specific example: in its June issue, and again in July, we get evidence in *MP* of the remarkable progress in large polythene hollow ware, *i.e.*, containers or tanks. As a result of the overcoming of earlier technological limitations, 'the industry today stands ready to supply containers with capacities ranging up to 500 gallons—with larger units likely' (*cf.* June issue, p. 85 *et seq.*). In the July issue (p. 88 *et seq.*) we have more evidence re plastics hollow ware, in this case again in connexion with *PE*, and especially of blow-moulding. In the August issue (p. 73 *et seq.*): 'In a major market revolution, blow moulded high-density *PE* bottles are now being specified by leading detergent makers to replace metal cans. . . .'

To one who, like the writer, tries to look (as from the side-lines) at progress in applications, and broadly from the quality and economic angles, it is above all—and, especially from the competitive aspect—the versatility of the plastics industry, perhaps, which is its most important feature. In competition with, say, a specific material, this versatility both as regards existing plastics materials and potential plastics, seems to be of prime importance.

Measurement of Ozone Cracking

In a recent issue of *RJIP* (*Views and Reviews*, September 5, p. 132) the writer was able to give some facts based on a paper by F. B. Smith and W. F. Tuley (Naugatuck Division, U.S. Rubber Co.) relating to the 'Accelerated Testing of Ozone Cracking Inhibitors.'

The subject of Ozone Cracking, in tyres especially, has become a very live one, and a reference to a paper in the *Transactions* of the *Institution* on a novel method of testing, namely by a 'Stress Relaxation Method of Measuring Ozone Cracking,' by H. A. Vodden and (Miss) M. A. A. Wilson (Monsanto Chemicals Ltd.), seems to me to fit nicely into the picture (*loc. cit.* June 1959).

After discussing previous test methods, including those of visual examination—methods not readily made quantitative—and those of Beatty and Juve and Leeper and Gable 'who use creep to measure deterioration,' the authors mention that the successful use of stress relaxation methods in rubber oxidation studies suggested the application of this phenomenon. Their paper describes an apparatus in which the stress relaxation at constant elongation of rubber exposed to ozone is measured.

Apparatus

The equipment used by the authors consists (*cf. Fig.* 1, p. 82) essentially of a test chamber through which ozonized air is circulated. The specimens—moulded bands 4mm. x 1mm. x 3in.—are inserted over hooks mounted in the test chamber in such a way that they can be extended either statically or dynamically, the tension being measured at suitable time intervals. Further details will be found in the paper.

Results

Amongst the conclusions reached by the authors the following may be mentioned:

a. The method (determination of the rate of stress relaxation at constant extension of rubber exposed to ozone attack) 'provides a simple quantitative measurement of degradation brought about by ozone.' It is added, however, that the method does not give information on the cracking pattern, and should be used in conjunction with visual examination.

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

b. Both under static and dynamic conditions the existence of a maximum rate of deterioration, when bands of NR or GR–S were exposed at a series of strains to ozone attack, was noted.

c. The method was used to examine the influence of various antiozonants on the rate-strain relationships of NR and GR–S filled stocks at ozone concentrations of 'a few parts per million,' and it was found that the procedure provides a promising basis for an accelerated test for antiozonant variation. In this regard some highly interesting observations were made, namely:

c_1. The results obtained showed two distinct types of antiozonant behaviour under the test conditions and

c_2. 'The results also show clearly that it is misleading to evaluate an antiozonant by comparing the rates of deterioration of a control band and a band containing an antiozonant at an arbitrarily selected strain since, when the antiozonant alters the position of the maximum of the control curve (Fig. 5), widely differing results and even complete reversal of effect can be obtained, according to the strain at which comparison is made.'

SP Brown Crepe

Rubber Developments in its Summer 1959 issue (Vol. 12 No. 2), amongst other interesting items, publishes an article by H. C. Baker on 'Introducing superior processing brown crepe' (pp. 44—46) with illustrations.

As the author remarks, 'Superior Processing natural rubber has hitherto been available only as first quality sheet or crepe the introduction of SP brown crepe is an important advance. It has been developed to meet the needs of many manufacturers who have asked for SP properties to be conferred on the lower grades of natural rubber.'

Control and tests

The SP brown crepe is produced, according to the article, under strict controls by estates and remilling factories in Malaya, the process being operated under licence from the Rubber Research Institute of Malaya.

With regard to details, it is to be noted that every batch is checked for uniformity of properties before shipment. Thus, all batches of SP rubber have to pass a test for extrusion swell in a tyre tread compound. The object of this test is to demonstrate 'that SP rubbers retain their distinctive properties in the presence of substantial loadings of fillers.'

It is pointed out in the article that the test control of the rate of cure and processing characteristics of SP brown crepe are more uniform than with ordinary brown crepe.

Amongst the figures (comparing SP 'Brown' with ordinary Brown Crepe in a soft red tubing compound) in a Table, the most characteristic differences are, I think, those for *Die Swell, Surface,* and *Collapse.*

It is added, in Baker's article, that recent pilot plant studies at Rubber Technical Developments Ltd., have shown that SP rubbers in extrusion allow a wider range of temperature conditions, permitting cooler extrusion and faster screw speeds. The table mentioned is as under*:

TABLE 1

SP brown crepe in a soft red tubing compound

Composition (figures in brackets for SP rubber): Rubber 100, zinc oxide 7 (5), activated whiting 20, vaseline 5, red oxide 5, stearic acid 1 (0.8), MBTS 1.4 (1.1), TMT 0.175 (0.14), sulphur 1.6 (1.3), Nonox EXN 1.

	SP Brown Crepe	Brown Crepe
Processing		
Compound Mooney viscosity	38	27
Mooney scorch time (min.)	16	18.5
Die swell (%)	47	130
Surface	Smooth	Rough
Collapse	Very slight	50%
Physical Properties (10 min. at 140°C.)		
Tensile strength (kg./cm.²)	251	291
(p.s.i.)	3,575	4,150
Aged ditto (kg./cm.²)	190	215
(p.s.i.)	2,700	3,050
Elongation at break (%)	680	695
Aged ditto (%)	580	565
300% modulus (kg./cm.²)	31	27
(p.s.i.)	440	400
Aged ditto (kg./cm.²)	37	36
(p.s.i.)	525	510
Hardness (°BS)	44	44

Acknowledgments to Mr Baker and to the Editor of *Rubber Developments.*

For trial samples and/or 224 bales apply BRPRA.

Notes

The *Dunlop Gazette* for June 1959 has reached me somewhat belatedly (owing to the recent incidents in the printing trade), but not too late to record (alas, very briefly!) some of its interesting features. These included an account of a visit to Dunlop's Montlucon factory by General de Gaulle, and a description of 'Factory Extension at Pannal.' In the latter are included illustrations of the continuous moulding conveyor in action, and of huge piles of Latex foam cushions awaiting despatch. However, I make no excuse for calling attention to a page in the 'Safety in the Home Series' notwithstanding the fact that the accidents dealt with on this occasion relate to those which occur in the holiday period. These are subdivided under the headings: In the Garden; Leaving Home; On the Road; In the Water; Caravanning, and Camping. You 'would be surprised' to hear of all the horrid things that may happen and do happen. Get a copy of the Gazette and see for yourself. I happen personally to take a special interest in road accidents, but no excuse is needed for quoting the following:

On the Road

'The best rules are those of the Highway Code and of courtesy and patience. Remember the saying: "Better be twenty seconds late in this world than twenty years early in the next." Especially at holiday times be careful not to create a bottle neck, either by dawdling on a trunk highway or by inconsiderate parking.' The penultimate word here reminds me of one of my own fads (?): this is that, in all motoring matters the word *careless* should be abolished, and replaced by *inconsiderate.* The former does not imply moral turpitude—as it should—whereas the latter does. And it is the 'inconsiderate' person who is, I hold, largely responsible for the shocking road casualties. I doubt whether, in effect, more accidents are caused by 'dangerous' driving than by 'inconsiderate' driving or action.

Returning to the June *Dunlop Gazette,* an article entitled: 'A Dunlopian looks at RMS Queen Mary' seems to me remarkably well 'done.'

PHILIP SCHIDROWITZ

*See also additional information Sheet B published by the Natural Rubber Development Board for the BRPRA. This sheet is for insertion in SP Rubber, BRPRA Technical Bulletin No. 2, issued previously.

Questions Corner—83

(Second Series)

351. What is the effect of β-radiation on polystyrene?

352. Caprolactam-based Nylon 6 has been suggested for extrusion moulding and centrifugal casting. Give some details.

353. Give details of one method of casting plastic film, etc., from the base monomer.

354. How is the methyl content of polythenes determined?

(Answers next week)

Answers to Questions Corner—82

347. It will be appreciated that when glass yarn is intended for weaving into fabric it must be coated with a size to prevent abrasion of the yarns during the weaving process. The size will affect the wetting and adhesion of any applied resin used in subsequent operations and must therefore be removed if good bonding between the glass and the resin is to be obtained, unless special sizes are used. Failure to remove the size when products are intended for electrical applications results in a high power factor and high water absorption.

There are four main methods of pre-treatment for removal of the size. *Heat cleaning* is a somewhat drastic treatment and consists in burning off the size at a high temperature. Temperatures up to 500°C. are used and about 0.2% residual carbonaceous matter remains. Infra-red or hot air ovens have been used. *Caramelization* consists in exposing glass fabric to a temperature of 300°C. by passing over a heated roller or heating in an oven. Part of the size is removed and the fabric has a golden brown colour. This leaves a residual carbonaceous matter content of ca. 0.5%. *Washing* consists in washing the fabric with a suitable detergent. *Application of a finish* involves removal of the size by one of the above methods, then the fibres are treated with a primer, which will vary according to the type of resin that is to be used.

It should be noted that determination of residual matter is important when the fabric is intended for electrical purposes, and two methods are used for its determination: *a.* Soxhlet extraction with carbon tetrachloride for a few hours, or *b.* Heating for one hour at 600°C.

All methods of pre-treatment, prior to impregnation, result in a reduction of the strength of the fabric. The higher the temperature the greater the loss of strength. For electrical purposes this is of less importance than efficient bonding of the resin.

348. Polyvinyl acetate is supplied, in the solid form, in a number of different grades and viscosities. They are colourless, odourless, tasteless and non-toxic. Their stability to light and heat is good, and their chemical resistance offers some advantage for several applications, but they are not recommended for resistance against strong alkalis. They are very resistant to salt spray, corrosive gases, oils and greases. Moisture vapour permeability is about the same as that of ordinary cellophane, and has about the same inflammability as that of cellulose acetate.

Low molecular weight polyvinyl acetate is somewhat soft and resinous but, on the other hand, becomes brittle at low temperatures. High molecular weight polymers show higher softening temperatures. However, many applications require a flexible polymer and although various plasticizers may be compounded with the polyvinyl alcohol, most users prefer certain co-polymers, *e.g.* with dibutyl maleate. This means that where there is an internal plasticizer present there is no risk of the plasticizer migration, and loss of flexibility.

Polyvinyl alcohol is soluble in a number of solvents such as the lower alcohols, esters, ketones in the cold. Xylene and coal-tar naphtha will dissolve it when hot and will swell the polymer when cold.

The main factor controlling the general properties of polyvinyl acetate is the degree of polymerization, and the solution viscosity varies with this. As the molecular weight increases so does the tensile strength, softening temperature and flexibility. It is thermoplastic and does not have a sharp melting point and there is a tendency to cold flow at room temperature, particularly with the low molecular weight grades when plasticizers, solvents and moisture are present.

Polyvinyl acetate resins absorb small percentages of water on prolonged immersion and acquire a milky appearance. This, however, disappears on drying.

349. Cellulosics are used as bonders in a number of industries and the following are some brief details.

Ceramics

Carboxymethyl cellulose is used where its ability to bind and suspend materials is of value. It is, of course, subsequently removed by being burnt out in the firing. In addition, it is used in both coloured and white glazes for sanitary ware, structural tiles and as a temperature binder in low tension electrical porcelains, and for patching plastics and cements. Hydroxyethyl cellulose finds a use in the ceramic industry as a binder and water retaining agent in dry moulding where it produces powders which have sufficient water present to exhibit plasticity under pressure. Also as a pigment binder and as a dispersant for the pigment-glass flock suspension used in the production of opal glass ware. The suspension is sprayed on the surface and subsequently fired which burns out the organic ingredient.

Pharmaceuticals

Hydroxyethyl, carboxymethyl and methyl cellulose are all useful binders for the preparation of tablets and are completely harmless when taken internally.

Paper

Carboxymethyl cellulose is used to improve fibre bonding and scruff resistance of paper. It is applied as a water solution at the size press or calender stack as, when applied at this point it stays on the surface. It also improves printability. It may be added to the beater when making paper from lightly beaten pulp to improve the strength. Alternatively it reduces the beating time when used for high strength papers. Hydroxyethyl cellulose, with glyoxal, is used as a binder for increasing the wet strength of paper used in toilet and cleansing tissues. It is applied by spraying.

Methyl cellulose is also used because of its high binding power in paper and paper board manufacture. Light surface coatings are useful in resisting the penetration of glossy ink, varnishes, lacquers and waxes.

350. The melt index of polythene is primarily an assessment of the flow properties of the polymer and it can generally be related to the molecular weight.

It is usually measured as the weight of polythene extruded through a given orifice. Previously the Williams parallel plate plastometer has been used (ASTM D926-47T) but this has been superseded in favour of the extrusion method. In this method a load of 2,160gm. moves in a vertical metal cylinder containing molten polythene at 190°C. and extrudes the polymer through a tubular die. The British apparatus (BB 1972-1953 App.A.) differs in small details from the American apparatus (ASTM 1238-52T) but they give substantially the same result.

The melt index, as has been stated, is a function of the molecular weight of the material. A low melt index, *i.e.* one with a low rate of extrusion, indicates a high molecular weight material with improved physical properties. A high melt index, *i.e.* with a high rate of extrusion, indicates a lower molecular weight polymer, with easy processing properties, but the strength will not be so good.

Also, it should be noted that where the melt index of two materials is close together, *e.g.* 2.0 and 2.1, it is possible for them to differ widely in their physical properties. The molecular weight distribution, and shape of the molecules, is considered to be responsible for this.

(More questions next week)

MEN and MATTERS

A Review of People and Events

by George A. Greenwood

A FAMOUS—or notorious—European statesman a few years ago said that 'Peace is indivisible.' He could just have well said it in respect of industry, alternating it to prosperity. It is only upon reflection, perhaps, that many of us have realized that the sombre events which are occurring in the Lancashire cotton trade must have some sort of effect upon the rubber industry, which nowadays processes so much material from the spindles and the looms.

For you will no doubt have seen what is happening. With misgivings in some quarters the cotton spinners, and manufacturers, and finishers, and so on, agreed to the Government's generous scheme to clear up redundancy by providing many millions of pounds in the way of compensation for closed mills and sheds and scrapped machinery, and now it is well under way. But mark the consequences! Within a few weeks, some of the old misgivings appear to have proved realities and some new ones have appeared.

Lives Saved by Liferaft

News has just been received of a rescue off the coast of Florida, in which a British (Dunlop Seafarer) inflatable liferaft was responsible for saving the three passengers and two crew of the 44-ton American yacht 'Chimaera.' The yacht was 20 miles east of Miami, on the way to the West Indies, when it struck a semi-submerged object which tore a large hole in her side 20ft. abaft the starboard bow at the chine. It was decided to abandon ship, and the liferaft was launched and boarded by the crew and passengers. Fifteen minutes later the 'Chimaera' sank.

The survivors were picked up by two helicopters, and three hours later the raft was picked up by the s/s Leverkusen bound for Antwerp. John D. Archibold, the owner of the yacht, in a letter to the manufacturer's agent in Portland Maine, said: 'The experience has taught me one lesson, which I believe should be passed on to all yachtsmen, and that is, a yacht should never go to sea without a self-inflating rubber raft.'

An Anti-Noise Point

A number of my old friends and acquaintances have roped me into the new Noise Abatement Society, the chairman of which is Sir Walter Fergusson Hannay, warmly supported by people like Sir Gerald Kelly, P.P.R.A., Sir Miles Thomas, Beverley Nichols, Mr Maurice Elvey, the film producer, not forgetting Doris Leslie, the noted historical novelist, who is otherwise Lady Fergusson Hannay.

And hereby hangs a tale. Protesting the other day at a meeting of the Nottingham City Council against the 'clatter and banging' of the dustmen on their weekly rounds, Councillor Mrs Angus Hamilton demanded of her colleagues: 'Why not devise a silent plastic dustbin, or at least a plastic lid to cut down the noise?'

She complained: 'The banging and bumping as dustmen drop lids on the ground and empty bins into the dust cart, spoil the peace of the whole district, especially in the summer time, when people have their doors and windows open.'

I couldn't agree more! But can you youngsters imagine what we old stagers suffered in the days of iron-wheeled vehicles lumbering along stone-sett-roads and streets before the days of the perfected rubber tyre?

Anxiety

There is a lot of anxiety as to what is going to happen to the many thousands of operators who are being thrown out of work, and there is a certain amount of evidence to indicate that, the dismantling going too far, we could well be in for a shortage of cloths and a rise in prices. This at any rate is the prediction of one prominent man in the industry, and here to back it up comes an illuminating piece of news from the Continent. The East Germans, who for years have been considerable buyers of Lancashire cotton yarn, are said to be deeply disturbed at the situation because they had been planning to increase imports by anything up to 50%, the amount being regulated only by the amount of currency they could raise.

A footnote to it all is that some of the firms who did not 'come in,' now find themselves overwhelmed with work, one of them having started a four-hour evening shift per week! A reasonable assumption is, I suppose, that all the substantial concerns which remain in the industry—and active—will follow the same plan and see to it that supplies both for the rubber and other industries are maintained as required.

The 'Chimaera' settles by the stern

New RABRM Members

During the current year, seven companies have become members of the Research Association of British Rubber Manufacturers. These are: R.F.D. Co. Ltd., Godalming, Surrey; British Resin Products Ltd., and Distrene Ltd., Piccadilly, London, W.1; Tensometer Ltd., Croydon, Surrey; Boulton Paul Aircraft Ltd., Wolverhampton; British Cellophane Ltd., Bridgwater; Shell International Chemical Co. Ltd., London.

Monsanto Appointments

Mr D. C. M. Salt has been promoted director of sales and Mr J. M. Kershaw director of development and market research of Monsanto Chemicals Ltd. The company has at the same time discontinued its divisional organization and its two divisional development departments have been unified under Dr J. A. Gardner as controller of development.

Mr Salt, who has been with Mon-Santo for 24 years, was previously general manager of the chemicals division. Mr Kershaw joined the company in 1946 and was formerly chief engineer. Dr Gardner, who was previously in charge of development planning, has served for 22 years with Monsanto.

Mr O. W. Murray, who joined the company in 1932, has been appointed chief engineer in place of Mr Kershaw.

Dow Johannesburg Office

The opening of a new sales office in Johannesburg has been announced by Dow Chemical International Ltd. S.A. John R. Myers, area supervisor in Midland, Michigan, for Europe and Africa, has been named Sales Supervisor of the office.

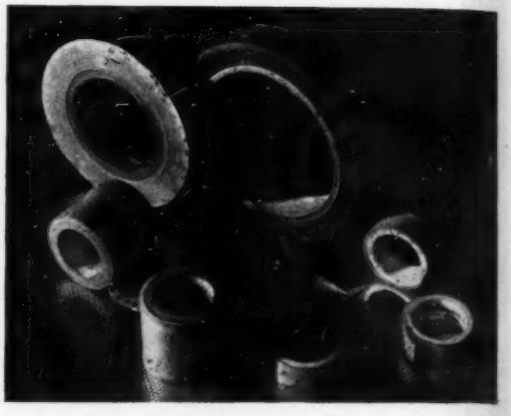
The address of the Chemicals Trading Co. Ltd., formerly 102 Bishopsgate, London, E.C.2, has been changed to Cree House, 18/20 Creechurch Lane, London, E.C.3. Telephone: AVEnue 5488.

I.C.I. 'Melinex'

NEW PLANT PLANNED

THE Plastics Division of Imperial Chemical Industries Ltd. is to erect a new plant near Dumfries for the manufacture of 'Melinex' polyester film. The plant will eventually have a capacity of 2,000 tons or more a year. I.C.I., the sole manufacturers of polyester film in this country, have been making it in small quantities on a pilot plant at Welwyn Garden City, Hertfordshire, since 1954. Although subsequently enlarged, the output of this pilot plant has permitted of little more than market evaluation. The new plant at Dumfries should satisfy all immediate requirements.

In the electrical industry the high dielectric strength and availability in very thin gauges of 'Melinex' make it an attractive material for small condensers, capacitors and electric motor slot insulators. In cables it can be used both as a barrier against water or plasticizers and as a strong, thin dielectric lapping material. Due to its low gas permeability, excellent flexibility at low temperatures and good chemical resistance, 'Melinex' has been used for lining hoses and for conveying gases, liquefied gas and corrosive chemicals. Remarkable dimensional stability finds it many useful applications in engineering and drawing offices as a replacement for conventional plastic films where accuracy is required.



Pressure - sensitive adhesive tapes manufactured by Johnson and Johnson (Great Britain) Ltd. on 'Melinex' polyester film base

G. H. Redman

AN APPRECIATION

AS announced in the last issue of *RJIP*, Mr G. H. Redman, managing director of J. E. Baxter and Co. Ltd., Leyland, Lancs., died on September 6 at the age of 76. During the war years he was directly associated with the manufacture of over 200,000,000 gas masks. The following is an extract from an appreciation by Mr L. B. Turner, former head of the Defensive Section, Chemical Warfare Department, of the War Office.

G. H. REDMAN

'My association with Mr G. H. Redman goes back for many years, and when one looks back one can now see things in perspective. One of the things which we can now see so clearly is, how fortunate this country was that it was so prepared in chemical defence when war broke out. To that state of affairs Mr Redman made no small contribution, and I shall always remember that it was my privilege to be associated with him in his various undertakings.

'It is so long ago as 1927 when the War Office entered into the agreement with J. E. Baxter and Co., and fortunate were we that that agreement, and the facilities it provided, were in existence when war came in 1939. Although the Germans had one or two highly unpleasant gases at their disposal, they were never used during the war, and we now know why. Contrary to the position in this country, there were not sufficient respirators in Germany for the civilian population, and the Germans dared not risk chemical warfare for fear of retaliation.

'To that fortunate position in this country Mr Redman made an outstanding contribution, and now that we mourn his passing, I remember this.'

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Review

SILICONES.—R. N. Meals and F. M. Lewis (pp. xi + 267. Reinhold Plastics Application Series, Reinhold Publishing Corporation, New York, 1959. Chapman and Hall Ltd., London. Price 48s. net).

There is some justification in publishing a general treatise on the technology of the silicones in a plastics series since many non-plastics silicones find application within the industry. The present volume surveys the subject in a verbose yet guarded manner as befits words of wisdom from but one of the manufacturers in a highly competitive field. It is unfortunate that such a highly diversified industry as silicone manufacture and applications did not receive the benefit of reviewers skilled in the art of concise presentation, for, had this been the case, some hundred or so pages could probably have been saved with relief to both the pocket and time of the reader.

The six chapters comprise a short introduction (which traces the growth of the industry), general properties, basic chemistry, manufacture and fabrication, applications and future prospects. The first two are acceptable but the third is somewhat trivial for the chemist who will be troubled by the lack of any references to published work and by some over-simplification of difficult concepts. We read in the editorial introduction (p. iii) that the authors have 'kept in mind as probable readers . . . design engineers, equipment manufacturers, producers of packages, manufacturers of packaging machinery, students at technical schools and, of course, all people in the plastics industry—material manufacturers, moulders, extruders, fabricators.' To please this mixed bag would seem to be an impossible task, and at the worst the book may seem unacceptable to all, but at least some improvement could have been effected by omitting the chapter on 'chemistry' and introducing what basic chemical concepts were felt to be of importance alongside the relevant sections on preparation, properties or applications. The section on applications lists a number of interesting end-uses of silicones which will probably not all be familiar to British readers but is it really necessary to include a half-page block showing sixty-odd bottles and tins of polishes in which silicones are incorporated?

In addition to poor marshaling of their material and omission of references (with the exception of a short bibliography), the authors or their publishers do not seem to have given proper attention to reading the proofs. Centigrade and Fahrenheit degrees coexist fairly peaceably but the presentation of some of the figures can certainly not pass without comment, particularly confusing being the vertical axis Fig. 2.10, the curious non-linearity Fig. 2.18, the omission of modulus units Fig. 2.25 and so on. In short, a useful purchase for the library on account of some useful information contained therein but by no means a standard work and a very poor example to student readers.—D.A.S.

∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London, S.E.1.

Mr L. A. Hygate has been appointed secretary of O. and M. Kleemann, and will also act as secretary to the company's subsidiaries. Mr F. Neal has resigned as secretary.

New I.C.I. Plant

THIRD CRACKER AT WILTON

THE tenth anniversary of Imperial Chemical Industries' Wilton plant has been marked by the opening of the heavy organic chemicals division's third olefine plant. This makes the I.C.I. complex at Billingham and Wilton on Tees-side the world's most comprehensive centre of petrochemical production and the largest outside the US.

About £120m. has been spent on the 600 acres of the 2,000 acre site at Wilton. The chief product high-purity ethylene, is produced at an annual rate of about 110,000 tons. Modifications to the existing plant increase its capacity to 140,000 tons.

A full report will appear in next week's issue of *RJIP*.

C. F. Widman

The death occurred recently at the age of 54 of Mr Charles F. Widman, a director of P. W. Merkle Ltd., the cutting machinery manufacturers, of 22/26 Paul Street, London, E.C.2. Mr Widman was well known for his work during the war in organizing machinery production.

The business is being continued under the control of Mr Widman's brother, Mr Gordon Widman.

Cyanamid Appointment

Mr. Charles F. Bonnet has been appointed associate director for the European Region of Cyanamid International at the company's European headquarters in Zurich. Mr Bonnet has been associated with Cyanamid for 25 years.

COLUMBIAN CARBON

Mr E. B. Brooks, vice-president of the Columbian Carbon Co., has announced the opening of the carbon black and pigment division's research centre at Princeton, New Jersey. Under the direction of Dr Carl W. Sweitzer, the new headquarters will be devoted to all phases of research and development of carbon black, pigments and related fields. The facilities, located on a 14-acre site, consist of two one-storey buildings. One building is designed for basic chemical and physical research and includes administrative offices, library, and six laboratories. The second building contains a group of seven large laboratories devoted to development and application research. Included in this area are a large conference room and machine shops

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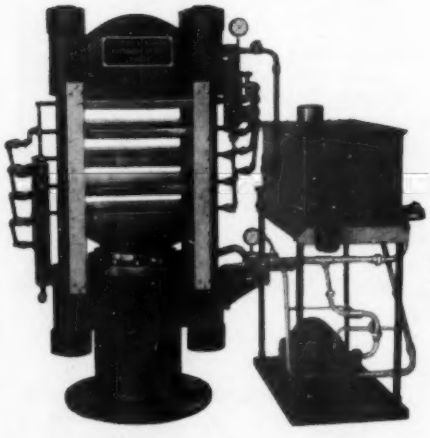

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Rubber Statistics

CANADA — JAPAN — VIETNAM — BELGIAN CONGO

THE Secretariat of the International Rubber Study Group has now released details of the rubber position in Canada and Japan up to the end of April this year.

Canada

Imports of natural rubber into Canada during the first four months of the year totalled 14,253 tons, of which 12,725 tons consisted of crude rubber and 1,528 tons of latex; during the comparable period of last year, imports totalled only 10,176 tons, this year's imports thus representing an increase of 25%.

Consumption of natural rubber during these four months similarly rose to 14,352 tons (10,234), the tonnage of latex being 1,337 tons (935). Stocks of natural on hand at the end of April stood at 4,182 tons, including 408 tons of latex.

Production of synthetic rubber in Canada during these months totalled 32,250 tons (42,464). Included in this total were 20,476 tons of S-Type and 6,224 tons of butyl. Consumption of synthetic amounted to 19,616 tons, stocks of synthetic stood at 8,289 tons (January 1 figure, 10,351 tons).

Reclaim rubber production amounted to 2,087 tons (1,536), and consumption totalled 6,056 tons (4,674 tons). Stocks of reclaim on hand at the end of April stood at 2,064 tons (1,400 January 1 1959).

Japan

Imports of natural rubber into Japan during the four month period ended April 30 last totalled 47,998 tons, including 43,772 tons of crude and 4,226 tons of latex (comparable period of 1958, 37,773).

Consumption of natural during these months totalled 48,090 tons (38,380). Stocks of natural on hand at the end of April stood at 13,621 tons of crude and 1,367 tons of latex (13,939 and 1,140, January 1 1959). Imports of synthetic rubber during these months amounted to 8,886 tons. Consumption of synthetic amounted to 8,410 tons (6,400) and stocks on hand stood at 3,526 tons (3,050 at January 1 1959).

Vietnam and the Belgian Congo

Exports from Vietnam during the first half of the year amounted to 30,163 tons (the comparable total for the first half of last year being 28,906 tons). Of this total, 9,028 tons went to Western Germany, 7,475 tons to France, and 6,024 tons to the USA.

Exports from the Belgian Congo have been published for the first five months of the year only. These amounted to 15,710 tons (1958 13,293 tons). The USA took 5,645 tons of this amount, Belgium 3,890 tons and France 2,718 tons.

Sole Crepe

During June, exports of sole crepe from Malaya totalled 652 tons, while those from Ceylon amounted to 104 tons and those from Vietnam to 24 tons. These totals brought sole crepe exports to the end of the half-year for these three territories to 3,541 tons, 308 tons and 76 tons respectively. 1958 figures were 5,151 tons (Malaya) and 674 tons (Ceylon).

Charles Calston Move

Charles Colston Ltd. announce that the head office of the Colston group of companies has moved to 7-11 Lexington Street, London, W.1. (Telephone GERrard 9531.) The group comprises: Charles Colston Ltd., Tallent (Aycliffe) Ltd., I.T.S. Rubber Ltd., Premo Rubber Company Ltd., Minibrix Ltd.

The telephone number of Union Carbide Ltd., London office, 103 Mount Street, London, W.1, is now Mayfair 8100.

Export Opportunities

Plastics-Working Machinery

Senor Eric Guegnier, of Eric de Mexico, SA, Diagonal 20 de Noviembre 362, Mexico, DF, is understood to be interested in representing UK suppliers of plastics working machinery.

Suppliers interested in this agency inquiry should write direct to Senor Guegnier and at the same time notify the Commercial Section, British Embassy, Lerma 71, Colonia Cuauhtemoc, Mexico 5, DF, PO Box 96 Bis., that they have done so. Board of Trade reference ESB/14825/59.

Plastics Raw Materials

The firm of Oy. Flinkenberg and Co. Ab., Bulevardi 28, Helsinki, have advised the British Embassy at Helsinki that they are interested in obtaining further agencies on behalf of UK firms for raw materials for moulding, acetate flakes, polythene, polystyrene, PVC resins and PVC compounds.

Interested suppliers in this agency inquiry should write direct to Oy. Flinkenberg and Co. Ab. and notify the Commercial Department, British Embassy, 18 Etela Esplanaadikatu (6th Floor), Helsinki, that they have done so. Board of Trade reference ESB/7303/59.

The address of the Export Services Branch of the Board of Trade is Lacon House, Theobalds Road, London, W.C.1. Telephone number: Chancery 4411, extensions 776 or 866.

Rubber Crop Returns

HARRISONS AND CROSFIELD LTD.

Java Companies

	July 1959 lb.		Fin. year to date lb.		No. of months
Bajoe Kidoel	232,539	(286,935)	851,974	(914,191)	4
Djasinga	109,496	(128,627)	109,496	(128,627)	1

	July 1959 lb.		Fin. year to date lb.		No. of months
Malaya General	196,000	(250,000)	2,299,000	(1,920,000)	10
Mengkibol	89,000	(88,000)	582,000	(522,000)	6
Sedenak	185,000	(202,000)	1,698,000	(1,570,000)	8

	August 1958 lb.	
Beau Sejour	68,866	(60,267)

	August 1959 lb.		Fin. year to date lb.		No. of months
Inch Kenneth Kajang	184,000	(183,000)	1,301,000	(1,309,000)	8

	July 1959 lb.		Fin. year to date lb.		No. of months
Kemasul	41,800	(41,400)	275,200	(277,550)	7

	August 1959 lb.		Fin. year to date lb.		No. of months
Kemasul	43,200	(50,400)	318,400	(327,950)	7

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PATENT SPECIFICATIONS

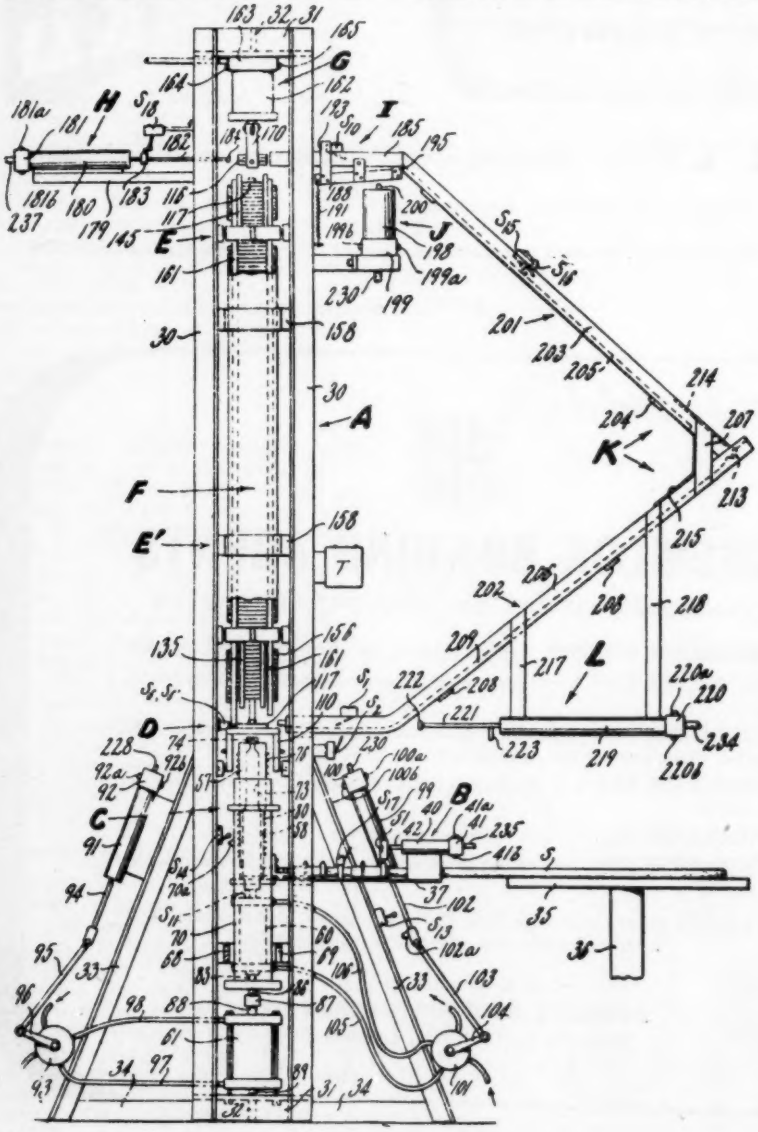
The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Automatic Rubber Moulding Machine

No. 812,452. United States Rubber Co. Application and Filed. September 24 1956. Application in USA, October 25 1955. Published, April 22 1959.

Rubber is moulded and vulcanized in a machine comprising electrically-controlled mechanisms which continuously and automatically carry out the following steps: Feed the rubber, position the unassembled mould parts, fill the mould cavities, assemble the mould parts, support the assembled moulds in stacked relationship, progressively vulcanize the rubber, re-position the assembled moulds, dissemble the moulds, eject the completely moulded and vulcanized articles from the moulds and re-position the unassembled mould parts for subsequent moulding and vulcanizing operations. It is stated in the Specification that by the use of the machine, all human labour normally employed at various stages of the moulding and vulcanizing operation is completely eliminated by continuous automatic operation.

As shown in the accompanying side elevation drawing, the machine comprises a supporting frame A on which are mounted the stock feed mechanism B, the injection unit C and its actuating mechanisms, the mould plate landing device D, the upper and lower mould column supports E, E¹, the mould column heating and guiding unit F, the mould disassembly mechanism G, the mould re-positioning device H, the mould release-catch lever mechanism I, the moulded article ejector mechanism J, and the slide K which supports the mould feed mechanism L. The mechanisms B, C, G, H, J and L are operated by a pneumatic circuit while their operation, along with that of the devices D, E, E¹ and I, are effectively controlled by an electric system. For details of the machine, reference should be made to the Specification, which contains 16 pages of text and 23 drawings.



Shorter Abstracts

Stabilizers. 811,683. The Dow Chemical Co. Filed, January 28 1957. —Hydroxyalkyl derivatives of alkylene diamines are claimed as stabilizers for copolymers of styrene and acrylonitrile.

Amides of Vinyl Ethers. 812,158. Rohm and Haas Co. Filed, December 7 1955.—N-vinyloxyalkyl substituted amides, as well as their polymers and copolymers, are claimed as new chemical compounds.

Call for Tenders

Retreading Equipment

The Government of India, India Supply Mission, 2536 Massachusetts Avenue, N.W., Washington 8, D.C. (address for bids), has issued requirements for a supply of retreading equipment required by National Coal Development Corporation (Private) Ltd., India. This purchase will be financed by the Development Loan Fund of the US Government. The tender is SE 104 and the closing date is November 3 1959.

Copies of the specifications and other documents relating to calls for tender under DLF Aid can be obtained from the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, at $3 per set. B.o.T. reference No. ESB/21707/59.

The address of the Export Services Branch of the Board of Trade is Lacon House, Theobalds Road, London, W.C.1. Telephone number: Chancery 4411, extensions 776 or 866.

A. Nash

The death occurred recently after a short illness of Mr Alfred Nash, a director of Cabot Carbon Ltd., 62 Brompton Road, London, S.W.13. Mr Nash had spent 40 years in the carbon black industry, first as an importer and distributor with Hughes and Hughes, and later as a director of Cabot Carbon on its foundation in January 1949. His work in this industry was recognized by the award of the O.B.E. in 1950.

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

THE London stock market has at last succumbed to the influence of the General Election. The volume of buying has fallen away and there is a growing tendency for prices of even the leading industrials to follow suit.

Among the plastics and rubber manufacturing shares there are very few outstanding features to be found. Despite several enthusiastic comments the ordinary of the DUNLOP RUBBER group were still a rather depressed market on fears of a price cutting war among the big tyre manufacturers. On the other hand ENGLISH CHINA CLAY were a buoyant feature with a rise of 1s. 3d. to 67s. at one time, on the view that the company must be feeling some benefit from the boom in the building industry.

The ordinary of the O. AND M. KLEEMANN concern were marked ex the recent 'rights' issue while the new ordinary settled down around 2s. 3d. premium. After their recent big rise the ordinary of BRITISH XYLONITE came back a little and the same was true of the ordinary of the COURTAULDS giant.

Hopes of improved figures, talk of a share bonus and the possibility of a bonus issue in the future aided the ordinary of the GREEFF CHEMICAL concern.

The general improvement in industrial activity helped the ordinary of TURNER AND NEWALL to a new peak of 79s. 10½d., while disappointment with the recent results clipped the ordinary of LEYLAND AND BIRMINGHAM rubber back to 48s. 9d., a loss of around 7s. 3d. since our last price table appeared.

DE LA RUE ordinary shares have been one of the better spots in the recent boom in share prices. The market in them has still the appearance of a very firm undertone. The directors have recently announced the result of the 'rights' issue to shareholders. The application for the 740,800 shares of 10s. which were offered for sale was in excess of 93%. The offer price was at the exceptionally attractive level of 27s. 6d. This is one of the puzzles of the London stock market and once again underlines the apathy of shareholders. In many instances non-application for 'rights' means their total loss to the shareholders concerned. In this case, however, there was a move by the directors to protect the laggards. The shares not applied for were sold on the open market and proceeds from these sales will be despatched to the shareholders who were entitled.

UNIVERSAL ASBESTOS has bought out the CHANCERY INSULATIONS company which manufactures an asbestos spray. No details of the cash involved in the deal were given at the time of the acquisition.

The ordinary shares of SILENTBLOC were a steady market following the maintained dividend of 25% for the full year. There are also proposals to issue new shares on a 'rights' basis in the ratio of one-for-six. This will involve some 550,000 shares which will be made available at a price of 3s. The directors anticipate being able to

Continued on page 230

Share Price Movements

Par Value	Company	1958-59 High	Low	Sept. 5	Latest
5/-	Albright & W. Ord. ..	29/10½	13/4½	29/9	28/6*
£1	„ „ „ 5% Pref...	16/7½	15/4½	16/3	16/3
5/-	Anchor Chemical Ord...	14/7½	10/3	14/4½	14/6
5/-	Andersons Rub. Ord. ..	4/3¾	3/-	3/2½	3/2½
2/-	Anglo-Amer. Vulc. Fibre Ord.	4/3	2/-	3/7½	3/9
£1	Angus Geo. Ord. ..	29/10½	21/-	28/3	28/3
5/-	Ault & Wiborg Ord. ..	23/-	11/9	21/9	19/6
£1	Avon India Rubber Ord.	42/6	27/-	40/-	38/9
£1	„ „ „ 6% Pref.	18/6	17/3	17/9	17/6
10/-	Bakelite Ord.	30/9	17/-	30/7½	30/-
£1	„ 6% Pref. ..	19/6	18/3	18/3	18/3
£1	Baker Perkins Ord. ..	47/9	30/7½	44/3	45/-
4/-	Bank Bdg. Rubber Ord.	3/1½	1/6	2/8½	3/1½
5/-	Boake (A.) Roberts Ord.	18/6	9/-	16/4½	17/-
£1	„ „ „ 5% Pref.	15/1½	13/9	13/9	15/-
4/-	Brammer H. Ord. ..	14/9	9/6	14/8½	14/-*
5/-	Bridge, David Ord. ..	32/-	16/3	32/-	32/-
5/-	Bright, John Ord. ..	13/10½	8/9	13/6	13/9
2/-	Brit. Ind. Plas. Ord. ..	8/6	4/9	8/4½	8/-
2/-	„ 10% (tax free) Pref.	5/9	4/7½	4/7½	4/3
£1	British Xylonite Ord. ..	61/3	28/6	61/-	58/9
£1	„ „ 5% Pref.	15/9	14/-	15/9	15/9
5/-	BTR Ind. Ord.	13/3	9/4½	8/11½	8/9
£1	„ „ 7½% Pref. ..	22/9	20/9	22/9	22/6
£1	Courtaulds Ord... ..	41/9	20/-	41/4½	40/3
£1	„ 5% 1st Pref.	18/6¾	15/7½	17/6	17/3
£1	„ 6% 2nd Pref.	20/3	17/1½	20/3	20/3
4/-	Cow, P. B. Ord. ..	7/3	3/6	7/2½	7/-
£1	„ 5% Pref. ..	14/3	10/9	14/3	14/-*
5/-	Dale, John Ord... ..	16/6	10/-	13/6	13/3
£1	„ „ 6% Pref. ..	16/-	13/-	15/10½	16/-
1/-	Dannimac Mfg. Ord. ..	8/9	2/6	8/7½	7/10½
10/-	De La Rue Ord. ..	54/-	42/9	50/6	50/3
£1	„ „ „ 3½% Pref. ..	12/3	10/-	10/9	12/-
6/8	Distillers Co. Ord. ..	28/9	15/9	28/6	28/3
£1	„ „ 6% Pref...	21/7½	19/10½	21/6	21/3*
£100	„ 5% Conv. Loan	£96½	£91	£94½	£93
£100	„ 5½% Unsec. Loan	£95	£87 7/16	£93¾	£93
10/-	Dunlop Rubber Ord. ..	25/6	14/9	25/4½	24/9
£1	„ 5½% Pref.	19/-	15/10	18/6	18/3
£100	„ 3¼%1st Debs.	£75½	£67¾	£75½	£75½
£100	„ 4½% 2nd Debs.	£84	£78	£84½	£82½
4/-	Ebonite Cont. Ord. ..	15/3	7/6	12/-	11/3
£1	English China Clays Ord.	67/-	29/9	65/9	66/3
£1	Goodyear Tyre 4% Pref.	12/9	12/-	12/6	12/6

Par Value	Company	1958-59 High	Low	Sept. 5	Latest
5/-	Greeff Chem. Ord. ..	27/6	14/-	25/-	27/-
10/-	„ „ 5½% Pref. ..	8/1½	7/9	8/1½	8/-
4/-	Greengate & Irwell Ord.	7/0¾	4/4½	4/9	4/6
£1	Harrisons & Crosfield Dd.	64/3	43/9	64/-	63/9
1/-	Hunt & Moscrop Ord. ..	1/9	1/1½	1/8½	1/9
£1	Imp. Chem. Ord. ..	42/9	28/3	42/6	41/-
£1	„ „ 5% Pref. ..	17/9	16/-	17/6	17/1½
£100	„ 4½% Unsec. Loan	£88½	£80	£88½	£88
£100	„ 5½% Conv. Loan	£136	£99	£131	£135½
1/-	Kleemann (O. & M.) Ord.	6/-	2/6	5/10½	5/6§
1/-	„ „ New Ord.	—	—	—	2/2½‖
£1	„ „ 6½% Pref.	17/-	15/-	16/9	17/-
2/-	Lacrinoid Prod. Ord. ..	2/4½	1/5¾	2/3¾	2/3
5/-	Laporte Ind. Ord. ..	27/6	13/7½	23/9	22/9
£1	„ „ 7½% Pref.	22/10½	21/10½	22/6	22/9*
£1	Leyland & Birm. Rubber Ord.	58/9	39/9	56/-	48/9
£1	„ „ 6% Pref.	21/3	16/1½	17/-	16/10½
2/-	London Rubber ..	11/1½	6/3	11/-‡	10/6
£1	„ 6% Red. Cum. Pref.	19/9	16/3	18/9	18/9
£1	McKechnie Bros. Ord.	45/-	23/6	43/-	41/3
£1	„ „ 'A' Ord.	44/6	30/-	42/-	38/9
£1	„ „ 6% Cum. Pref.	17/-	16/-	16/6	17/-
5/-	Monsanto Chem. Ord. ..	19/6	13/-	19/6	18/3
£1	„ „ 3¾% Pref.	13/-	11/-	13/-	13/-
£100	„ 6% Debs.	£104	£101½	£103½	£103
£1	North British Rubber ..	—	—	16/-	16/-
5/-	Redfern Holdings Ord...	5/2½	2/10½	4/7½	5/-
2/-	RFD Ltd. Ord.	6/6	3/5½	5/6¾	5/6
£1	„ „ 5½% Pref. ..	15/-	11/6	14/9	14/9
2/-	Rubber Imp. Ord. ..	15/6	4/9	5/10½	5/6
2/-	„ „ 'A' Ord.	14/3	4/6	5/0¾	4/6
£1	„ 5% 1st Pref.	12/3	10/-	10/-	10/-
5/-	Rubber Reg. Ord. ..	13/-	10/6	12/9¾	12/3
4/-	Shaw Francis Ord. ..	16/4½	9/9	16/4½	16/3
2/-	Silentbloc Ord. ..	10/6	7/6	10/2½	10/3
2/-	Sussex Rubber Ord. ..	1/11½	7½	1/10½	1/7½
5/-	Sutcliffe Speak Ord. ..	8/10½	5/-	8/-	8/6
£1	Turner & Newall Ord. ..	79/10½	52/-	77/1½	79/4½
£1	„ „ 7% Pref.	25/-	22/1½	25/-	24/9
5/-	Universal Asbestos Ord.	26/10½	8/0¾	26/9	23/9
5/-	Viscose Dev. Ord. ..	13/9	6/3	11/6	11/3
5/-	Warne William (Holdgs.) Ord.)	14/9	8/-	13/10½	14/-*

*Ex-dividend †Ex-all ‡Ex-bonus §Ex-rights ‖Premium

Rubber Markets

LONDON

An all-round fall of 1d. per lb. or more has been recorded in the London rubber market during the week. The Spot price is 1d. down at 32d. nominal while forward positions record larger falls in some cases. The sharp setback in the market followed the news that the US stockpile is to sell 470,000 tons of rubber over the next nine years and the totally unexpected news that the UK Board of Trade is to liquidate its strategic stockpile of some 100,000 tons as quickly as possible but without affecting the market. These two items unsettled the market and it is feared that the recent sustained strength of the market will be affected.

Latest prices are as follows:

No. 1 RSS Spot: 32d. nominal.

Settlement House:

October 30⅜d.-31d.
October/December 30¼d.-30½d.
January/March 28⅜d.-28⅞d.
April/June 28d.-28¼d.
July/September 27¼d.-27⅜d.
October/December 27d.-27¼d.

No. 1 RSS cif basis ports:

October 30d.-30¼d.
November 29¼d.-29½d.

Godown:

October 102⅛ Straits cents nominal.

LATEX

Centrifuged latex per gallon in drums, October shipment, 18s. 6d. seller, cif European ports. Spot, 19s. nominal. Bulk, 18s. 4d. nominal. Creamed, seller, 17s. 11d. November. Normal, seller, 14s. 1d. September/October.

AMSTERDAM

The Amsterdam rubber market ruled as follows on September 14:

	Guilders per kilo	
No. 1 RMA	Sept. 14	Previous
September	3.05	3.05
October	3.04	3.04
November	3.03	3.03
December	3.00	3.00
October/December ..	3.02	3.02
January	2.90	2.90

Sales: 90 Tendency: Quiet

CEYLON

No. 1 RSS

The price of No. 1 RSS spot at Colombo on September 14 was 129¼ (129) Ceylon cents per lb.

SINGAPORE

The market opened at around previous levels on September 14 and ruled very quiet. Fluctuations were small. The majority of dealers were disinclined to trade awaiting clarification of United States stockpile policy. Lower sheet interest was meagre and largely confined to the September position. Factories were quiet. The market ruled very quiet throughout the afternoon. Little business was done. Some covering before the holiday caused a small spurt and when this was over, prices eased to slightly below the best levels of the day. After-hours the market was idle. The rubber market will be closed tomorrow—birthday of the Prophet Mohammed.

	Straits cents per lb., fob Malayan ports to open ports	
	Close	Previous Close
No. 1 RSS, Oct.	107 –107⅛	106⅞–106⅞
Nov.	105 –105⅛n	104¾–105
No. 2 RSS, Oct.	105⅛–106⅛n	105⅛–106
No. 3 RSS, Oct.	104⅜–105⅛n	104⅜–105⅛
No. 4 RSS, Oct.	103⅛–104⅛n	103⅛–104⅛
No. 5 RSS, Oct.	102 –103	102 –103
No. 1 RSS, Spot	110⅛–110⅜	110 –110⅛
No. 3 blanket, thick remilled, Oct.	103 –105	102⅛–104⅛
No. 1 fine pale crepe, Oct. ..	116⅛–118⅛	116 –118
2x thin brown crepe, Oct. ..	102⅛–103⅛	102 –103

Tendency: Idle

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rec. drums fob at 210.00d. per gallon.

NEW YORK

The New York rubber market ruled as follows on September 14:

DEALERS' PRICES

	Ex-dock, US cents per lb.	
	Today	Previous
No. 1 RSS, Sept. ..	40n	39½b–39¾a
Oct. ..	38½n	38½b–38¾a
No. 2 RSS, Sept. ..	39¾n	39½b–39¾a
Oct. ..	38½n	38b –38¼a
No. 3 RSS, Sept. ..	39½n	39b –39¼a
Oct. ..	38n	37½b–38a
No. 1 RSS, Spot ..	40½n	40n
No. 3 amber blanket crepe, Nov. ..	36½–37	37b –37¼a
No. 1 latex, thin crepe, Sept. ..	38¾n	38¾n
No. 1 latex, thick crepe, Sept. ..	39¾n	39¾n

FUTURES—REX CONTRACT

	US cents per lb.	
	Close	Prev. Close
Sept. ..	38.60b–40.60a	38.50b–40.50a
Nov. ..	37.60t	37.50t
Jan. ..	35.70t	35.95t
March ..	34.90t	35.00b–35.20a
May ..	34.10b–34.25a	34.25b–34.40a
July ..	33.40b–33.65a	33.65b–33.90a
Sept. ..	33.10b–33.35a	33.35b–33.60a

Sales: 45 Tendency: B'steady

Rubber futures were a shade lower in meagre dealings on September 14. Traders said that interest was quiet. Rubber dealers and factories were waiting to see how the GSA will operate under the new law on stockpile rotation which was signed recently by the President. Physical rubber was quiet and about steady. Later in the day, rubber futures were steady in the nearby position and softer in the more distant months. Physical rubber was steady.

DJAKARTA

There was only small incidental trading on September 14 owing to the lack of cash. Thirty tons of sheet No. 1 were sold at 28.10 rupiahs and another 25 tons at 28.00 rupiahs. The market was steady but quiet.

	Rupiahs per kilo	
	Sept. 14	Previous
Spot No. 1 Priok	28.10–28.00t	27.50b
Spot No. 2 Priok	27.00t	26.50n
Spot No. 3 Priok	26.00–26.60t	25.75t
No. 1 fine pale crepe, spot ..	Unquoted	

Tendency: Quiet

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on September 14 was 35.00 (34.75) US cents per lb.

STOCK MARKET

Continued from page 229

maintain the existing dividend on the increased capital. For the year to May 31 last the group profit came out at £306,000 against £297,000 and the net figure, after taxation, was £15,000 higher at £149,000.

LAWES CHEMICAL is to make a bonus issue on the basis of one new share for every four already held. This will involve the capitalization of £100,000 of existing capital reserves.

There is a divergence of opinion in the City about the recent bid for the WEBLEY AND SCOTT concern which takes in R. H. WINDSOR. The directors of Webley and Scott accepted the share exchange offer from ARUSHA INDUSTRIES which at that time was worth around 14s. 6d. for each Webley share. Before the bid was announced Webley shares had been changing hands at around 20s. Since that time, however, Arusha shares have fallen back and because Arusha now apparently holds control Webley shares have also tumbled to around 12s. 6d.

After accepting the offer on behalf of their own holdings the Webley directors advised other shareholders to do likewise, but there is a resistance movement in the City and the men behind this are advising rejection of the offer pending further information.

Mr W. Moore, A.M.I.Mech.E., A.M.I.Prod.E., has been appointed technical and development engineer of the rubber and plastics division of Reed Bros. (Engineering) Ltd. Prior to joining the company he was the development engineer of the Greengate branch of the Greengate and Irwell Rubber Co. Ltd., before which he held various positions in the Design Department of Francis Shaw and Co. Ltd.

Industry INTELLIGENCE

Technical Data

'Solka-Floc' in Rubber and Plastics

'Solka - Floc' is a finely - divided, highly-purified wood cellulose material of American manufacture. It is available in a number of grades, the average particle size of which ranges from 35 to 165 microns according to the grade. An investigation of the behaviour of this material in natural rubber and SBR compounds is reported in a revised edition of 'The Properties and Applications of "Solka-Floc" in Rubbers and Plastics,' by W. H. Stevens (published by Johnsen Jörgensen and Wettre Ltd., 26 Farringdon Street, London, E.C.4. Agents for the Brown Co., USA).

The principal effect of 'Solka-Floc' when used as a compounding ingredient in rubber is a pronounced reduction in shrinkage of the unvulcanized rubber compound. For example, the shrinkage of an unvulcanized natural rubber pure-gum type of compound was reduced from 40% to 10% by addition of 10 phr of 'Solka - Floc.' The material facilitates processing of rubber, reduces the 'nerve' of unvulcanized compounds (particularly useful in the case of butyl rubber) and results in improved surfaces of calendered and extruded products. When 'Solka-Floc' is used in sponge rubber, greater uniformity in blowing operations is achieved. Recipes are given for a number of natural rubber and SBR compounds containing 'Solka-Floc' together with physical test results of the vulcanizates. The compounds include resin rubber and microcellular rubber soling, artificial leather, floor tiles and sponge rubber. Reference is made to the use of the material in latex foam rubber and in plastics. In melamine moulding powders, for example, the proportion of 'Solka-Floc' ranges from 25 to 35% depending upon the properties required. 'Solka-Floc' is suitable also as a flocking material for rubber surfaces, one particular grade being recommended for this application.

Pliabrac 990

Pliabrac 990, a plasticizer for PVC and vinyl chloride copolymers, is a modified form of Pliabrac 989. It is comparable with the latter in most of its properties but is superior in that it is much less volatile and has an even lower viscosity. It imparts improved resilience to PVC compounds as well as excellent low-temperature properties. It is of particular interest where a low total plasticizer content is required, as in the manufacture of rigisols, and is useful in the formulation of antistatic products as it gives PVC compounds of low volume resistivity. Pliabrac 990 has good stability to heat and light and is much less expensive than most low-temperature plasticizers of comparable efficiency.

A comparison of the plasticizing properties in PVC of Pliabrac 990, Pliabrac 989, di-2-ethylhexyl sebacate, di-2-ethylhexyl phthalate and Phthalate 79 is reported in Technical Information Sheet 234 issued by A. Boake, Roberts and Co. Ltd., Abrac Works, London, E.15. The compounds were plasticized to give a modulus at 100% elongation of 1,100 psi, the amount of plasticizer being of the order of 60 parts per 100 parts of PVC. Data are given for the following properties of the compounds: Tensile strength, elongation at break, BS softness number, cold flex temperature, volatility, plasticizer efficiency factor and loss in weight after immersion in various solvents. The effect of plasticizer content (25 to 45%) for each of the above five plasticizers on modulus, low-temperature flexibility and volume resistivity is shown graphically. PVC plastisols containing Pliabrac 990 have a low viscosity and decrease in viscosity considerably with increasing temperature; consequently, they are useful for rotational moulding, particularly where a low plasticizer content is required.

Machines, Materials and Equipment

Small Bore Cylinders

To meet the demand for a robust small bore cylinder of light construction, Baldwin Industrial Controls Ltd., Dartford, Kent, have introduced three new basic cylinders to their range. Bore sizes are ¾in., 1in. and 1¼in. with strokes ranging from 1in. in the ¾in. bore size to 10in. in the 1¼in. bore size. Cylinders can be either

double acting or single acting with a spring return. These cylinders have been designed primarily for light holding, clamping, or similar jobs where small physical size combined with rugged construction are first considerations. Maximum air pressure is 150 psi, delivery is ex-stock and prices range from 19s. 6d. each.

Corrosion Protection of Water Tanks

A new method of protecting rust formation on the inside of water tanks of 100 to 1,500 gallons, has been evolved by Southern Metalife Ltd., Station Square, Harrogate, Yorks. The solid 'Metalife' anodic unit can be installed in a few minutes without it being necessary to empty the tank. Once installed, the manufacturers state, the unit will give 8 to 12 years' service depending on the exact size of the tank and the type of water. All the metal below the water line will be protected even if the water is so hot that the coatings and galvanized iron break down. Any rust that has already been formed in the tank will be removed. The installation of one of these units saves the inconvenience and cost of repainting, and eventually the cost of installation of a new tank.

Publications Received

'Planters' Bulletin'

The July issue, No. 43, of 'Planters' Bulletin,' the organ of the Rubber Research Institute of Malaya, contains a number of items of interest. These include articles on 'The Disposal of Skin Serum,' 'Assessment of the Growth of Clone RRIM 501,' 'Wind Damage,' 'Ladder Tapping of Budded Trees: Height of Opening,' and the 'Checking of the Spread of Root Disease.' The editorial examines a topic of interest to the rubber industry, 'From "Synthetic" to "Synthetic Natural".'

'Nylaflow' Pressure Hose and Tubing

Polypenco Ltd., 68-70 Tewin Road, Welwyn Garden City, Herts., have issued a leaflet outlining the properties and applications of its 'Nylaflow' pressure hose and tubing. This tubing is available in two alternative burst pressure ratings of 5,000 and 8,000 psi and consists of a specially formulated polyamide inner tube, reinforced with high tensile strength yarn. 'Nylaflow' hose is entirely new in conception and offers unusual possibilities to industry for such applications as hydraulic and pneumatic lines, fuel and oil lines, solvent or hot paint lines, high pressure lubrication lines, freon lines, and high pressure CO_2 lines, etc.

Technical Notes 200

The 200th issue of 'Technical Notes,' the organ of CIBA (ARL) Ltd., Duxford, Cambridge, contains an account of the celebrations to mark the company's 25th anniversary and the opening of new buildings—a new factory for the manufacture of 'Araldite' epoxy resins, a new research block, and a new sales block. This consistently well-produced journal features on its front cover interesting comparative pictures of the covers of its first issue, January 1943, then under the name of Aero Research Technical Notes, and the last issue, No. 199.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

NYPAC (788,061) For conveyor belting and machine belting. By B.T.R. Industries Ltd., Herga House, Vincent Square, London, S.W.1. (Class 7; June 3 1959.)

RESIMIX (786,206) For chemical compounds made principally of synthetic resins for use in industry for moulding. By W. Pickard and Co. Ltd., Saxon Works, Rutland Road, Sheffield, 3, Yorkshire. (Class 1; June 10 1959.)

GLASTEC (781,386) For shaped covers and guards all being fittings for machines included in Class 7; guards, being fittings for agricultural implements of the larger kind; pipes and tubes, all being parts of machines; and casings being fittings for parts of motor vehicle engines included in Class 7; all made of plastics reinforced with glass fibre; and machine tools for pressing. By Glass Fibre Fabrications Ltd., Peel Street, Stalybridge, Cheshire. (Class 7; June 10 1959.)

FLEXIRIVE (B781,339) For rivets made wholly or principally of rubber, artificial rubber or of combinations of rubber and artificial rubber. By Parlatex Ltd., Walrow, Highbridge, Somerset. (Class 17; June 10 1959.)

VULCALASTIC (786,616) For textile piece goods made of mixtures of textile fibres and of extruded rubber yarns. By Alberton Ltd., Pretty Polly Mills, Buxton Road, Leek, Staffordshire (Class 24, June 10 1959.)

ROVENGLAS (786,520) For pipes and tubes, all included in Class 17; and pipe fittings and pipe couplings; all made of plastics reinforced with glass fibres, the plastics predominating. By Thomson Tubes Ltd., 10 Hanover Street, Hanover Square, London, W.1. (Class 17; June 10 1959.)

RILOVER (784,849) For flexible sheets of plastics included in Class 17 for application to flat surfaces for protective or decorative purposes. By Rubber Improvement Ltd., Rilex House, 2 Chandos Street, London, W.1. To be associated with No. 784,850 (4220, 555). (Class 16; June 10 1959.)

Future Event

Society of Chemical Industry

Plastics and Polymer Group.—Wednesday September 23 at the Chemistry Lecture Theatre, Birkbeck College, Malet Street, London, W.C.1, at 6.30 p.m. 'Vinyl Graft Copolymers,' by Dr P. Weiss (General Motors Corporation, USA). Joint meeting with Birkbeck College.

NEW COMPANIES

S. M. Alexander and Co. Ltd. (627,562).—May 7. Capital: £75,000 in £1 shares. To acquire the goodwill and assets of the business of craftsmen in high frequency sealing of plastic films, carried on as S. M. Alexander and Co. at Bridge Works, and 215 Upper Street, N.1. Regd. office: 29 Museum Street, London, W.C.2.

J.N. Tyre Services Ltd. (627,786). May 8. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, tyres, etc.

Dykehouse International Co. (UK) Ltd. (627,819).—May 8. Capital: £100 in £1 shares. To carry on the business of industrial and engineering designers and draughtsmen, general design consultants, etc. The directors are: Robert H. Dykehouse, 140 Great West Road, Hounslow, Middlesex, plastics engineer and director of Cooke and Dykehouse Plastic Machinery Co. Ltd., etc.; Graham B. Batten, 58 Wentworth Way, Sanderstead, Surrey; Kenneth J. Rowles, 47 Falconwood Road, Addington, Surrey. The last two named are plastics engineers and directors of R. and B. Plastics Engineers Ltd. Regd. office: 118 Old Broad Street, London, E.C.2.

Wylon Ltd. (628,035).—May 12. Capital: £5,000 in £1 shares. To carry on the business of manufacturers of and dealers in plastic substances and materials and goods made therefrom, etc. The directors are: Jack G. Openshaw, 'Eaglehurst,' Barry Rise, Bowdon, Cheshire; William K. Robertson, 27 Bywater Street, London, S.W.3. Regd. office: 42 Bedford Avenue, London, W.C.1.

Kew Laminates Ltd. (626,274).—April 20. Capital: £5,000 in £1 shares. To carry on the business of manufacturers and fabricators of insulating materials for switchgear and for the electrical trade in general, etc. The directors are: Sidney Ketch, 15 Esher Road, Kingstanding, Birmingham; Clive R. Edmunds, 22 Hollywood Lane, Birmingham; Samuel L. Waters, 65 Midhurst Road, Kings Norton, Birmingham 30. Regd. office: 20 Mole Street, Sparkbrook, Birmingham 12.

Edmonton Tyre Service Ltd. (626,266).—April 20. Capital: £100 in £1 shares. To carry on the business of dealers in and manufacturers of motor tyres and accessories, etc. The directors are: Frank Dewson and Nellie B. Dewson, both of 180 Whitefield Road, Cheshunt, Herts. Regd. office: 50 Church Street, Edmonton, London, N.18.

Lancashire Waste (Plastics) Ltd. (628,299).—May 15. Capital: £100 in £1 shares. The directors are: Sidney M. Ordman, Mrs. Beatrice Ordman, both of Netherwood Road, Northenden, Manchester, 22, directors of Lancashire Waste Co. Ltd. Regd. office: 3 Marsden Street, Manchester 2.

PATENT LIST

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COMPLETE SPECIFICATIONS ACCEPTE

Open to public inspection on July 15 1959

Imperial Chemical Industries Ltd. Polymeric foamed materials. 816,6

E. I. du Pont de Nemours and Co. Polymeric polyether - polyurethane 816,651.

Hudson Engineering Corporation. Method for moulding reinforced plas material. 816,437.

L. Jangfer (trading as Akkumul Torenfabrik Dr. I. Jungfer). Manu facture of porous plastic plates or foil which are corrugated, pitted or em bossed. 816,713.

Imperial Chemical Industries Ltd. Polymerization of olefins. 816,614.

E. I. du Pont de Nemours and Co. Isocyanate based polymers. 816,653.

Permutit Co. Ltd. Chloromethylation of aromatic polymers. 816,583.

Rohm and Haas Co. Vinyl polymer polyepoxy coating composition 816,630.

Ethyl Corporation. Polymerization process. 816,586.

Imperial Chemical Industries Ltd., E. Knowles and T. J. Meyrick. Bonding of polyethylene terephthalate fibres t rubber. 816,640.

British Dielectric Research Ltd. Manufacture of metallized polytetra fluoroethylene and products thereof 816,641.

Dehydag Deutsche Hydrierwerke G.m.b.H. Plasticising and gelatinizing agents for high-polymeric substances 816,528.

Halvic Kunstoffwerke G.m.b.H. Pro cess for coating rigid sheet material with thermoplastic synthetic resins 816,696.

Phillips Electrical Industries Ltd. Polyvinylbutrayl adhesives. 816,589.

Westinghouse Electric International Co. Silicone-modified polyester resins 816,535.

Olin Mathieson Chemical Corporation. Thermoplastic shot gun cartridge and method of closure therefor 816,544.

Open to public inspection on July 22, 1959

Hairlok Co. Ltd. Manufacture and treatment of porous rubber and like materials. 816,853.

Centre National de la Recherche Scientifique. Methods of cross-linking or vulcanizing synthetic resins or rubbers by means of ionizing radiations 816,791.

Ruhrchemie A.G. Process for the purification of solid polymers of mono olefinic hydrocarbons. 817,132.